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ABSTRACT

Workers' Perceptions of Earnings Growth and Employment Risk*

In addition to realized earnings and employment shocks, forward-looking individuals are presumed to condition their consumption and labor supply decisions on their subjective beliefs about future labor market risks. This paper analyzes these perceptions of earnings and employment risks using rich monthly panel data. It documents considerable individual heterogeneity in expected earnings growth and earnings growth uncertainty and in the perceived likelihood of a voluntary and involuntary job exit. We examine how these expectations evolve over the working life and the business cycle, and how they co-vary with expectations about the macro economy. Our analysis provides novel evidence on the perceived persistence in earnings growth shocks and on the association between future earnings and spending growth.

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1 Introduction

A longstanding and consequential area of economic research has been the empirical study of the nature, magnitude, and evolution of individual earnings and income volatility and their implications for inequality and for consumption and saving choices. To date, much of this work has focused on the realizations of earnings and income shocks, but for forward-looking agents their *beliefs* about future earnings and income volatility are similarly important for the economic decisions they make as workers and consumers. For example, Ben-David et al. (2018) find that individuals with more uncertain expectations about their personal and macroeconomic situation exhibit more precaution in their consumption, credit, and investment behaviors. More broadly, the effect of an income shock on consumption depends on the extent to which the shock was anticipated and depends on the perceived persistence of the shock.

In contrast to an expansive literature on realized shocks (Gottschalk and Moffitt (1994, 2009); Guvenen (2009); Guvenen et al. (2014, 2017, 2021); Moffitt et al. (2022)), and on how such shocks affect consumption (Meghir and Pistaferri, 2011; Arellano et al., 2017), relatively little is known about consumers' perceptions of earnings and income uncertainty and their beliefs about the drivers and persistence of such earnings shocks. Furthermore, little is understood about how these perceptions change over the working life and over time as economic conditions change, sometimes quite sharply as during the onset of the pandemic, and how such changes in beliefs in turn influence consumers' outlook and decisions. Access to high quality subjective expectations data that can capture such uncertainty helps improve our knowledge and ability to analyze how perceived uncertainty relates to economic behavior and outcomes. A better understanding of the effects of labor market risks on aggregate saving, consumption, and labor supply in turn is valuable for assessing the implications of changing wage as well as earnings inequality and volatility for consumer welfare.

In this paper we analyze workers' beliefs about several important sources of uncertainty about their own labor market outcomes: on-the-job earnings growth and risk of layoff and quitting. We examine how they differ across workers and types of jobs, how they evolve over the working life and business cycles, and how they covary with consumers' expectations about the economy. We also study the perceived persistence of earnings shocks. To do so, we use a decade worth of monthly data from the New York Fed's Survey of Consumer Expectations (SCE), a monthly survey that collects rich data on a wide range of probabilistic expectations of consumers since June 2013. Our results display substantial heterogeneity in reported subjective expectations and uncertainty, which underscores the value of subjective expectations data and the need to collect such data rather than making assumptions about the way individuals form their expectations. We find that beliefs about future earnings growth shocks exhibit considerable asymmetry and indicate that individuals generally expect relatively small earnings shocks but that they also assign a non-negligible probability to very large shocks. Male, younger, college-educated respondents, and those working full-time, working in the private sector or self-employed have significantly

higher average year-ahead earnings growth expectations. Average earnings growth uncertainty instead is significantly higher for female, younger, non-white, single respondents, and workers without a college degree, as well as for those working part-time, working in the private sector or self-employed. Earnings growth is found to be negatively, while earnings growth uncertainty is positively correlated with the perceived likelihood of both voluntary and involuntary job exits.

We find that average expected earnings growth and earnings growth uncertainty decline gradually over the working life. Underlying these changes is a gradual compression of individuals' density forecasts of year-ahead earnings growth as well as a convergence in the dispersion in density means. In contrast, we find average layoff risks to be remarkably stable through the working life, eventually increasing slightly as a worker approaches retirement age. Average quit probabilities, on the other hand, show a U-shape pattern in age.

Examining how expectations evolved over the past 10 years, we find an initial drop in earnings growth expectations and average quit probabilities and a jump in the average perceived layoff risk at the onset of the pandemic. By 2021 we see a sharp rebound with earnings growth expectations exceeding, and layoff risks dropping well below, pre-pandemic levels. Interestingly, throughout the pandemic, earnings growth uncertainty remained remarkably stable showing only a small increase during the pandemic recession.

Our analysis shows that workers' perceptions of labor market risks co-vary with their subjective expectations about the economy as well as the prevailing unemployment rate. Earnings growth expectations have a positive, statistically significant relationship with year-ahead inflation expectations, but the association is fairly weak and indicates a relatively weak perceived pass-through of price to wage inflation. This finding is also consistent with the relative stability of earnings growth uncertainty through the pandemic, despite sharp swings in realized and expected inflation and inflation uncertainty (Armantier et al., 2021; D'Acunto et al., 2022). Earnings growth expectations are somewhat more strongly and negatively associated with unemployment expectations and positively associated with stock market, and interest rate expectations. Similarly, both layoff and quit risks are found to be positively associated with unemployment, stock market, and interest rate expectations, while layoff risks increase with the local unemployment rate.

Investigating the dynamic properties of earnings growth expectations at the individual level, we find that while individual earnings growth expectations and earnings growth uncertainty are highly persistent over time, a considerable share of that persistence is explained by permanent time-invariant idiosyncratic differences across individuals. Our analysis also provides novel evidence on worker perceptions of the persistence in earnings shocks. Through the elicitation of joint distributions of future earnings growth at different horizons as well as a set of so-called strategic survey questions in which respondents are presented different hypothetical earnings-growth-shock scenarios, we find perceived persistence in earnings shocks to be weak.

Finally, we examine the relationship between earnings growth and spending growth expectations, by eliciting the joint distribution of year-ahead earnings and spending growth. We find expectations about spending growth to correlate meaningfully with expectations about earnings

growth, on average, with the strength of the association showing only limited variation across demographic groups. However, we find significantly weaker perceived covariation between future spending and earnings changes for respondents with higher levels of earnings uncertainty, consistent with precautionary savings.

Our paper contributes to the literature by documenting key stylized facts about individual expectations and uncertainty both across the life cycle and over the past 10 years, utilizing the long time series component of our survey. More importantly, this is, to the best of our knowledge, the first paper in the literature to investigate the perceived persistence in earnings growth shocks. To do so we use a set of "strategic survey" or conditional expectations questions (Ameriks et al., 2011) in which respondents are presented different hypothetical scenarios for past year's earnings growth. Using this experimental approach we generate controlled exogenous variation in the past year's earnings growth. With these hypothetical scenarios, we elicit the revisions in respondents' expectations of year-ahead earnings growth and measure the perceived persistence in earnings shocks. We then compare this measure to the auto-correlation implied by the respondents' joint distribution of one-year-ahead and two-year-ahead earnings growth realizations. Finally, we provide new evidence on the perceived association of changes in earnings growth with changes in spending growth by eliciting the joint distribution of future earnings growth and spending growth as well as by investigating how the correlations implied by these individual-level joint distributions relate to labor market risks.

The rest of the paper is organized as follows. Section 2 provides a brief discussion of related literature. Section 3 describes the SCE and the expectations measures we use in this study. Section 4 presents new evidence on the evolution of earnings growth, earnings growth uncertainty, and perceived employment risks over the working life cycle, while section 5 considers their evolution over the business cycle. In section 6 we analyze the covariation of earnings growth and employment expectations with macroeconomic expectations and in section 7 we examine individual-level dynamics in reported earnings growth expectations. Section 8 introduces the strategic survey questions and joint distributions we use to capture the perceptions of persistence in earnings shocks, while section 9 presents new evidence on workers' perceived association between future earnings and spending growth. Section 10 concludes.

2 Related Literature

An important and substantial body of work has examined variation in realized earnings and labor market outcomes across individuals and time. Of particular focus has been the nature and evolution of earnings volatility. A recent study by Moffitt et al. (2022) represents an attempt to reconcile the seemingly disparate empirical evidence on recent trends in male earnings volatility observed in different data sets. They find that volatility increased during the period from the 1970s to the mid-1980s, but detect no clear trends since then. Results in Moffitt and Zhang (2022) further show that while the patterns of volatility tend to be similar across all levels of the cross-sectional

earnings distribution, when the distribution of earnings changes is considered the volatility trends have been most pronounced in the tails. Moffitt and Zhang (2018) find that during the period of rising volatility, both permanent and transitory variances trended upward. Looking more broadly at income risks, Guvenen and Smith (2014) find income shocks to be only moderately persistent, and find income growth rates to display significant cross-sectional heterogeneity. Arellano et al. (2017, 2018), using rich register data from Norway, uncover greater complexity in earnings dynamics, finding that the earnings process features nonlinear persistence and conditional skewness, which they show affect consumption choices.

A related area of economic research has focused on how earnings or wage dynamics affect consumption choices over the life cycle. Meghir and Pistaferri (2011) provide a comprehensive review of this research and highlight two important factors affecting consumption responses to income or earnings shocks: the perceived persistence of these shocks, and the extent to which they were anticipated. These factors are especially important for understanding ex-ante responses (such as delayed purchasing, precautionary savings and labor supply) and ex-post responses (adjustments in consumption, leisure, dissaving). A key issue, they argue, is that observed consumption choices reflect beliefs about the income process that consumers have at the time decisions are made. This points to the potential value of subjective expectations data for the analysis of consumption decisions.[1] In a recent paper Wang (2023) assesses the implications for consumption and precautionary savings behavior of the heterogeneity in perceived income risks as captured in year-ahead earnings growth density forecasts and job loss and finding probabilities reported in the SCE. He finds that a standard incomplete-market macroeconomic model calibrated on these subjective expectations data is better able to explain the degree of wealth inequality and the share of consumers with little liquid wealth in the data than when using a standard approach of calibrating the model based on the objective (realized) income process.

Our work also relates to the literature on the predictability of earnings shocks, which has important implications for assessing the insurability and welfare effects of earnings uncertainty. In absence of subjective expectations data, one approach for assessing agents' ex ante beliefs and knowledge about future earnings growth and uncertainty is to infer these from observational data on choice decisions that depend on the information set of the agent (Blundell and Preston (1998); Blundell et al. (2008); Cunha et al. (2005); Cunha and Heckman (2008); Guvenen (2009); Guvenen and Smith (2014)). The idea is that consumers behaving rationally will make consumption, labor supply and human capital investment decisions that reflect the amount of risk that they face. For example, a large consumption response to a given income change would suggest that the income change was unanticipated and persistent. More generally, with advance information, future realized earnings growth should be correlated with current consumption behavior. Using such an approach, Guvenen (2007) finds that 62 percent of the variability in income growth rates

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[1]Some good illustrations of the value of subjective expectations data are the studies by Hayashi (1985), using panel of Japanese households containing respondents' expectations about expenditure and income, and by Pistaferri (2001) and Kaufmann and Pistaferri (2009), using panel data on income realizations and quantitative expectations about next year's income for Italian households.

is forecastable by individuals at the time they enter the labor market. Similarly, Cunha et al. (2005) analyze students' decision to go to college to estimate what components of measured lifetime income variability are due to uncertainty and what components are due to predictable heterogeneity (known at the time the decision is made). They find that about half of the variability in returns to college education is forecastable and acted on by the agents when making college decisions. [2]

Later in the paper we will contrast this approach for assessing the information individuals have about future earnings as revealed by economic choices, with our approach of directly measuring perceived earnings uncertainty and risk. Direct elicitation has important advantages, relying on fewer assumptions regarding rationality of beliefs and the insurability of risks. In contrast with inference solely based on observed behavior, the addition of subjective expectations data permits identification of available information that consumers either choose not to, or are unable to act upon.

A growing literature examines individuals' beliefs about the different sources of uncertainty they face in the labor market. This work has been facilitated by a rapid expansion in recent decades of high-quality household surveys, eliciting probabilistic expectations on a range of individual and household level outcomes and behaviors (Manski, 2004). Some of the research involving labor market expectations (such as those by Dominitz and Manski (1997a); Stephens Jr (2004); Campbell et al. (2007); Hendren (2017); Mueller et al. (2021)) was recently reviewed by Mueller and Spinnewijn (2023).[3] Empirical evidence shows job loss expectations to be lower for male, white and older workers, and workers with a college degree (Dominitz and Manski (1997a); Manski and Straub (2000); Guiso et al. (2002)).

Regarding research on subjective expectations of future earnings, Manski (2004) reviews some of the early evidence on the information and predictive content of earnings expectations. Much of the literature since then has focused on perceptions of earnings premia to educational investments. Studies in this literature, reviewed recently by Giustinelli (2023), typically analyze data from surveys eliciting earnings expectations from high school and college students. The focus of these studies has been on assessing their perceived returns to schooling, and the returns to obtaining a degree in different college majors. Respondents are typically asked about their expected earnings at several points of time in the future, under different hypothetical educational attainment scenarios.

This line of research has yielded a number of noteworthy findings. Earnings expectations have been found to display higher variation within gender and schooling groups than between groups (Dominitz and Manski (1997a); Mazza and Hartog (2011)). Students believe that the monetary returns to a college education are positive and heterogeneous in magnitude (Boneva and Rauh, 2021; Dominitz and Manski, 1997a), and to increase with age (Dominitz and Manski, 1997a). All else equal, female students on average expect lower starting wages (Briel et al., 2022), significantly

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[2]Cunha and Heckman (2016) extend this framework to show that a large component of the rise in inequality for less skilled workers in recent years is due to the increase in the variance of the unforecastable component of income.

[3]This handbook chapter also reviews some work relating job loss expectations to consumption behavior both prior and after actual displacement, and to job search behavior and job-to-job transitions.

lower median college and high-school earnings, (Brunello et al., 2004; Mazza and Hartog, 2011), and significantly lower monetary returns to a college education than male students (Botelho and Pinto, 2004; Brunello et al., 2004). The gender gap in future earnings is expected to increase with age, consistent with female students expecting to enter jobs with lower relative earnings growth, and this gap is only partly explained by gender differences in expected college major and occupation choices (Brunello et al., 2004; Reuben et al., 2017). Students' earnings expectations have also been found to vary systematically across majors, and are consistent with income sorting in the choice of majors. More generally, evidence indicates that earnings expectations are a significant predictor of education decisions (Hartog et al., 2014,?; Schweri and Hartog, 2017; Attanasio and Kaufmann, 2014, 2017) as well as college major choices (Arcidiacono et al., 2012; Zafar, 2013; Wiswall and Zafar, 2015, 2021; Patnaik et al., 2020).

A small set of studies have analyzed individuals' perceived earnings uncertainty. They generally report high average levels of uncertainty, but also substantial heterogeneity across individuals (Dominitz, 1998; Dominitz and Manski, 1997b; Bruine de Bruin et al., 2011). Dominitz (1998) finds subjective earnings uncertainty to be much higher among self-employed respondents, while Dominitz and Manski (1997b) find uncertainty to increase with the subjective median of the distribution. Regarding differences across demographic groups the literature is somewhat less conclusive. Some studies find uncertainty to increase with educational attainment level (Dominitz and Manski, 1997b; Schweri et al., 2011; Bruine de Bruin et al., 2011), but Mazza and Hartog (2011) find no difference. Dominitz and Manski (1997b) and Mazza and Hartog (2011) find uncertainty to decrease with age, while Schweri et al. (2011) find it to increase in age. Mazza and Hartog (2011) observe that females perceive higher wage risk than males, but Dominitz (1998); Schweri et al. (2011) and Bruine de Bruin et al. (2011) report lower uncertainty for female respondents. It is unclear to what extent these differences in findings across studies are due to differences in sample composition.

In contrast to considerable data and analysis of earnings expectations among high school and college students, only a few studies have collected earnings expectations of the population at large. As a consequence, relatively little is known about how earnings expectations evolve over the life cycle and over time. Dominitz and Manski (1997b) and Dominitz (1998) analyze year-ahead income and year-ahead and 6-month-ahead earnings expectations from respondents in the 1993 and 1994 waves of the Survey of Economic Expectations, a national household survey.[4] Both studies find expectations, elicited in the form of density subjective probabilities, to vary in sensible ways with contemporaneous earnings realizations and with other individual attributes. Bruine de Bruin et al. (2011) examine subjective earnings uncertainty reported by respondents in Rand's American Life Panel and report considerable heterogeneity and persistence in individuals' perceptions of future earnings uncertainty.

In a study perhaps most closely related to our current study, Guiso et al. (2002) examine nom-

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[4]Dominitz (1998) also analyzed 6-month-ahead job loss probabilities collected in the Survey of Economic Expectations.

inal earnings expectations and job loss expectations of respondents in the Bank of Italy's 1995 Survey on Household Income and Wealth (SHIW), a large representative sample of the Italian population, as well as job loss expectations of US respondents in the Michigan Survey. They find higher average levels of earnings uncertainty among self-employed workers, lower average levels for older respondents, and marginally statistically higher uncertainty for the more educated. Their analysis also indicates that subjective earnings uncertainty affects the level of saving in the direction predicted by precautionary savings theory. Like Guiso et al. (2002), we examine distinct sources of labor market uncertainty, in our case uncertainty about future on-the-job wage growth and the risks of involuntary and voluntary job departures in the U.S.[5] However, our analysis takes a step further and also considers the perceived persistence of earnings shocks. We do so in part by building on earlier research involving the elicitation of univariate density forecasts as well as by eliciting joint density distributions.

Finally, our paper also contributes to the literature that uses "strategic survey" questions (see Ameriks et al. (2011); Fuster and Zafar (2023); Kosar and O'Dea (Kosar and O'Dea); Ameriks et al. (2020) for more detailed discussions of this methodology) to identify particular model parameters or features. Utilizing these type of "strategic" questions to identify model parameters goes back to Barsky et al. (1997), who obtained direct measurements of parameters governing risk tolerance, time preference, and intertemporal substitution using a survey using hypothetical scenarios. This experimental approach enables causal identification of model primitives by generating controlled exogenous variation and in our analysis we use them to identify the perceived serial correlation in earnings growth shocks.[6]

3 Data

The analysis in this paper is based on data from the New York Fed's monthly Survey of Consumer Expectations (SCE). The SCE is a nationally representative, internet-based survey of a rotating panel of approximately 1,300 household heads. Since June 2013, the SCE Core Survey collects information on household heads' behavior as well as their expectations about a wide range of economic outcomes, both macroeconomic (such as inflation, home price changes, unemployment, credit access) and at the personal level (including income and spending growth expectations, credit applications and labor market behavior and outcomes).[7]

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[5]While reported job quit probabilities capture a mixture of a primitive source of uncertainty (offer arrivals, exogenous layoff shocks) and behavior (accepting the offer or choosing to move to unemployment), in practice the distinction between job layoffs and quits can often be ambiguous. For example, in response to an advance notice of a future layoff, a worker may quit and switch to another job. Alternatively, a worker who was able to immediately find another job upon layoff may report that he/she left voluntarily. For this reason, we decided to include the risk of quitting in our analysis of perceived labor market uncertainty.

[6]For another example, please see Armantier et al. (2022) who discuss the advantages of the approach and use it to evaluate the extent to which inflation expectations are anchored.

[7]The SCE questionnaire design followed an extended testing and experimentation phase over 2006-12 that used in-depth cognitive interviews, psychometric surveys and various pilot surveys. This testing phase is documented in Van der Klaauw et al. (2008) and Armantier et al. (2017).

A key feature of the survey is its reliance on a probabilistic question format to elicit the likelihood respondents assign to different future events. In addition to questions asking respondents for their *point forecasts*—for example, in the case of year-ahead earnings growth we ask: *Suppose that you are working in the exact same job at the same place you currently work, and working the exact same number of hours.*[8] *By about what percent do you expect your earnings to have [increased/decreased]?*—for several continuous outcomes, we also ask for density forecasts, that is, the likelihood the respondent assigns to different future possible values of that variable. In the case of earnings growth, for example, respondents are asked about the likelihood that future earnings changes will fall within different pre-specified intervals. These density forecasts allow us to assess respondents' uncertainty about future outcomes.

Respondents participate in the panel for up to twelve months, with a roughly equal number of respondents rotating in and out each month. The rotating panel nature of the SCE allows researchers to analyze how expectations are revised over time and how these expectations link to outcomes and behavior. Each month, the monthly core survey is paired with a rotating topics module. These topics modules, generally fielded triannually, focus on either the labor market, credit markets, household spending, or public policy changes. In addition to the monthly SCE Core and the triannual rotating topics modules, the SCE fields occasional "special surveys" on an ad-hoc basis to answer specific research or policy questions.[9]

The research in this paper is based primarily on probabilistic expectations data collected monthly in our core SCE survey. Our measure for earnings growth expectations is a density forecast based on the following question, asked to all respondents currently working,including the self-employed:

Suppose that, 12 months from now, you are working in the exact same job at the same place you currently work, and working the exact same number of hours. In your view, what would you say is the percent chance that 12 months from now ...

increased by 12% or more	_____	*percent chance*
increased by 8% to 12%	_____	*percent chance*
increased by 4% to 8%	_____	*percent chance*
increased by 2% to 4%	_____	*percent chance*
increased by 0% to 2%	_____	*percent chance*
decreased by 0% to 2%	_____	*percent chance*

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[8]For those working in multiple jobs the question is asked about their main job, defined as the job at which you usually work the most hours.

[9]Examples include special modules conducted to elicit the marginal propensity to consume out of the savings generated by the sharp decrease in gas prices in 2015, or the 2017 Tax Cuts and Jobs Act; perceptions and expectations around the enactment of the Affordable Care Act; perceptions and expectations of house price changes following the Tax Cuts and Jobs Act.

decreased by 2% to 4%	_____	*percent chance*
decreased by 4% to 8%	_____	*percent chance*
decreased by 8% to 12%	_____	*percent chance*
decreased by 12% or more	_____	*percent chance*
Total	100	

Based on reported bin probabilities we then compute each respondent's density mean (our measure of earnings growth expectations) and the interquartile range (IQR, our measure of earnings growth uncertainty) following the procedure described in Engelberg et al. (2009).[10] As we ask respondents to condition on staying in the same job, our measures of expected earnings growth can be interpreted as capturing expectations about on-the-job wage growth.

We measure employment expectations by eliciting the perceived risk of job loss and the probability of (voluntary) quitting. More specifically, those currently working and are not self-employed are asked

What do you think is the percent chance that you will lose your ["main"/"current"] job during the next 12 months?

Similarly, probabilistic expectations about quits are elicited by asking

What do you think is the percent chance that you will leave your ["main"/"current"] job voluntarily during the next 12 months?

For both of these questions, asking for the probability of a future job loss or quit, we allow respondents to either enter a number, or click anywhere on a sliding scale from 0% to 100%.[11]

In addition to data from the core monthly SCE survey, in our analysis we use data from the tri-annual labor market module and a special module in December, to which we added several special questions. These include questions to elicit the joint density of one-year and two-year ahead earnings growth, and the joint density of year-ahead earnings and spending growth, as well as several "strategic survey" or conditional expectations questions. These questions, which we will describe in more detail in sections 8 and 9, were designed to capture the perceived persistence in earnings shocks as well as the expected impact of earnings shocks on future consumption/spending behavior.

Table 1 reports summary statistics for our pooled sample of monthly data covering June 2013 to December 2022. The average year-ahead expected earnings growth (measured by the average of individual density means) is 3.11%, while the median equals 2.45%. The data exhibit large dispersion in expected earnings growth and considerable average individual uncertainty as mea-

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[10]We assume the underlying distribution to belong to the generalized beta family when the respondent assigns positive probability to three or more outcome intervals. We assume an isosceles triangular distribution when the respondent puts all probability mass in two intervals and a uniform distribution when the respondent puts all probability mass in one interval. Once fitted, the estimated density parameters are used to compute each individual respondent's density mean and density IQR. For further details see Armantier et al. (2017).

[11]To prevent respondents from anchoring their response, no marker appears on the scale until the respondent clicks somewhere on it.

TABLE 1: Summary Statistics

	Mean	Median	Std. Deviation
Expected year-ahead earnings growth (%)	3.11	2.45	4.93
IQR of year-ahead earnings growth (%)	3.44	1.51	4.45
Density skewness v1: $\frac{(p75-p50)}{(p50-p25)}$	1.03	1.00	0.17
Density skewness v2: $\frac{(p90-p50)}{(p50-p10)}$	1.08	1.00	0.34
Density skewness v3: $\frac{(p95-p50)}{(p50-p5)}$	1.12	1.00	0.47
Likelihood of a layoff (%)	14.04	5.00	19.78
Likelihood of a quit (%)	19.98	10.00	25.82
% White	0.82	.	.
% Female	0.51	.	.
% Married	0.65	.	.
Age	46.47	47.00	11.84
% Has child under age 6	0.16	.	.
% College graduate	0.36	.	.
% Working FT	0.63	.	.
% Self-employed	0.11	.	.
% Working for government	0.35	.	.
Annual earnings ($ 1000)	59.72	48.00	43.78
Tenure at current job (years)	8.52	5.25	8.92
Observations	117,397		

Note: Likelihood of layoffs and quits are over the subsequent 12 months.

sured by the average of individual-level density IQR. The average skewness measures point to an asymmetry in the expected earnings growth density, showing a slight positive skew. This is also apparent in the average bin probabilities shown in Figure 1 which reveals a notable average likelihood of 6.1% assigned by respondents to a greater than 12% earnings increase. This finding is consistent with evidence reported by Guvenen et al. (2021) which reveals the distribution of realized earnings shocks to have a high kurtosis; with most individuals experiencing very small earnings shocks and a small but non-negligible number experiencing very large shocks. In terms of risks of layoff and quits, respondents assign an average of 14% and 20% to the probability that they will leave their jobs involuntarily, and voluntarily, respectively, within the next 12 months. Again we see considerable dispersion in the reported likelihoods.

Table 2 shows simple pairwise correlations between our main expectations measures. They reveal expected earnings growth and earnings growth uncertainty to be positively correlated, while expected earnings growth is negatively correlated with the reported likelihood of an involuntary job exit. Earnings growth uncertainty is positively correlated to the likelihood of a layoff or quit, while the two types of job exit risk are fairly strongly positively correlated.[12][13]

Considering the heterogeneity in reported labor market risks, Table 3 shows the average expected year-ahead earnings growth to be significantly higher for male, younger, college educated respondents, workers with a young child, and those working full-time, working in the private

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[12]In Figures A1-A4 we portray these pairwise relationships in more detail through binscatter plots.

[13]Dominitz (1998) similarly report job loss risk to be negatively (positively) associated with expected earnings growth (earnings uncertainty).

FIGURE 1: Average Likelihood Assigned to Each Bin in Earnings Growth Density Forecasts
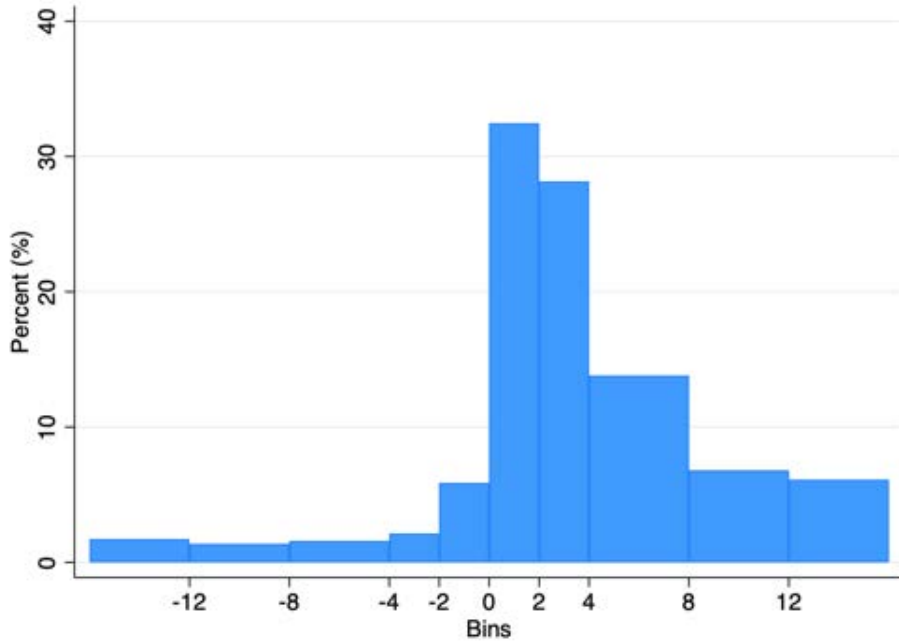

TABLE 2: Correlation Matrix of Earnings Growth Expectations and Employment Risk Measures

	Exp. year-ahead earnings gr.	IQR of exp. year-ahead earnings gr.	Likelihood of a layoff	Likelihood of a quit
Exp. year-ahead earnings gr.	1.00	.	.	.
IQR of exp. year-ahead earnings gr.	0.16***	1.00	.	.
Likelihood of a layoff	-0.11***	0.10***	1.00	.
Likelihood of a quit	-0.01***	0.04***	0.35***	1.00

sector or self-employed. In Table A1 we relate expected earnings growth to all characteristics simultaneously, together with a few additional controls from the SCE Labor Market Survey, including current annual earnings and tenure at the current job.[14] We find that with the exception of having a young child all differences remain statistically significant, and also find average expected earnings growth to be larger for higher earning respondents, and for respondents with lower job tenure.

Average earnings growth uncertainty measured by the density IQR are significantly higher for female, younger, non-white, single, and respondents without a college degree, as well as for those working part-time, working in the private sector or self-employed. These differences again remain when controlling for all worker and job characteristics jointly in a regression (estimates shown in Table A1).[15] We also find earnings growth uncertainty to be negatively correlated with the level

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[14] The regressions also control for region and year fixed effects.

[15] Dominitz (1998) also finds higher earnings uncertainty for self-employed individuals.

of current earnings and with job tenure.[16]

When considering density skewness, which correlates strongly with the likelihood of a substantial earnings increase, we find male, white, college educated and younger workers and those not self-employed to exhibit more positive skewness in their earnings growth densities. These differences are robust to controlling for other characteristics, and we also find higher skewness for respondents with lower job tenure.

TABLE 3: Perceptions of Earnings Growth and Employment Risk for Different Demographic Groups

	Exp. Year-Ahead Earnings Gr.	IQR of Exp. Year-Ahead Earnings Gr.	Density Skewness v3	Likelihood of a Layoff	Likelihood of a Quit
Overall	3.11	3.44	1.12	14.04	19.98
Female	2.92***	3.60***	1.11***	14.11	20.56***
White	3.10	3.10***	1.12***	13.65***	19.48***
Married	3.13**	3.23***	1.12*	13.25***	18.81***
College graduate	3.34***	2.85***	1.14***	13.52***	22.49***
35< Age ≤45	3.17***	3.56***	1.13***	13.91***	18.99***
45< Age ≤55	2.79***	3.23***	1.09***	13.85***	17.05***
55< Age ≤65	2.63***	3.10***	1.09***	15.17***	18.86***
Has child under age 6	3.53***	3.58***	1.15***	12.82***	19.64*
Working FT	3.18***	3.23***	1.12	13.18***	19.15***
Self-employed	4.53***	5.64***	1.08***		
Working for government	2.60***	2.78***	1.11	10.93***	17.68***

Note: The stars shows the significance of pairwise tests for equality of means between the group that is shown and the opposite group. For age groups, the tests are against the group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Interestingly, we generally see similar demographic patterns for layoff risk as we see for earnings growth uncertainty. Average reported layoff risks are significantly higher for respondents who are non-white, single, and working part-time and working in the private sector. Layoff risks are lower for those with a child under age 6 and are negatively correlated with current earnings and with job tenure. When controlling for all covariates jointly, layoff risk is positively associated with having a college degree.[17] Finally, turning to heterogeneity in reported quit probabilities in Table 3, we find patterns very similar to those for layoff probabilities, including a higher quit probability for those with a college degree. Like average layoff risk, the risk of quitting is negatively correlated with current earnings, and job tenure.[18]

One may wonder about the extent to which differences in labor market risks across workers are related to the level of non-wage benefits on the job. We investigate this in Table 4 by relating our measures of earnings growth expectations and layoff and quit risks to a set of non-wage benefits measured in our SCE Labor Market Survey. We find the employer provision of health and dental insurance and of commuter benefits to be positively related to earnings growth ex-

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[16]Moffitt et al. (2022) similarly report higher levels of realized earnings volatility at lower earnings levels.

[17]Meghir and Pistaferri (2004) find that more educated workers face higher overall realized earnings risks. Our evidence on perceptions of earnings risks suggest that the higher risks among college educated is driven by higher employment and job mobility rather than higher on-the-job wage growth.

[18]The fact that many of the same factors positively correlated with layoff risk are also positively correlated with the risk of quitting is consistent with some possible ambiguity in classifying the nature of a job departure.

pectations, while finding employer provided benefits to be largely negatively correlated to wage growth uncertainty and to perceived risk of a voluntary or involuntary job departure over the next 12 months. Although these estimates cannot be interpreted as causal, they are inconsistent with non-wage benefits serving as compensation for increased uncertainty and job exit risks, and instead suggest that jobs with better non-wage jobs also tend to have lower labor market risks.

TABLE 4: Earnings Growth Expectations and Non-wage Benefits

	(1) Exp. Year-Ahead Earn. Gr	(2) IQR of Exp. Year-Ahead Earn. Gr	(3) Density Skewn. v3	(4) Pr(Layoff)	(5) Pr(Quit)
Defined benefit plan	0.08	-0.08	-0.02**	-2.23***	-2.30***
	(0.11)	(0.11)	(0.01)	(0.41)	(0.55)
Employer contributes	0.29**	-0.14	0.01	-2.63***	-2.61***
to ret plan	(0.12)	(0.11)	(0.01)	(0.50)	(0.65)
Health or Dental	0.25	-0.44**	0.00	-1.71**	-0.77
Ins.	(0.18)	(0.18)	(0.02)	(0.84)	(0.99)
Flex spend acct	-0.18*	-0.23**	0.00	0.04	-0.42
	(0.11)	(0.11)	(0.01)	(0.45)	(0.59)
Housing subs	0.17	0.04	-0.03	0.47	-4.25***
	(0.37)	(0.24)	(0.02)	(1.84)	(1.52)
Life or disab. ins	-0.18	-0.33***	-0.01	-0.84*	0.33
	(0.13)	(0.12)	(0.01)	(0.49)	(0.63)
Commuter benefits	0.20*	-0.20**	-0.00	0.78*	1.36**
	(0.11)	(0.09)	(0.01)	(0.45)	(0.64)
Child care	0.13	0.19	0.01	-1.89***	-3.02***
assistance	(0.13)	(0.13)	(0.02)	(0.54)	(0.82)
Demographics	X	X	X	X	X
Region Dummies	X	X	X	X	X
Year Dummies	X	X	X	X	X
Dep. Var. Mean	2.97	3.00	1.12	13.62	19.82
R^2	0.03	0.08	0.01	0.05	0.06
Observations	16245	16245	16245	16381	16384

Note: Density skewness v3 refers to $\frac{(p95-p50)}{p50-p5}$ of the earnings growth expectations (density means) in the sample. Demographics include dummies for being female, white, married, having a child under age 6, college graduate, working full-time, self-employed as well as age group dummies, log annual earnings, and tenure at the current job. Robust standard errors are in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Before moving to a deeper analysis of these and other measures of labor market uncertainty, it is instructive to discuss some available evidence on their validity. As reviewed and further analyzed by Mueller and Spinnewijn (2023) exploiting the panel aspect of the survey, some of the SCE measures of labor market risks we analyze in this paper have been found to be predictive of future outcomes. Namely, realized quit and layoff rates have been found to be higher for those who reported higher probabilities of such events in the three months prior. Similarly, Dominitz and Manski (1997a); Stephens Jr (2004) and Campbell et al. (2007) find job loss expectations to be predictive of realizations in the Survey of Economic Expectations, the Health and Retirement Survey, and the British Household Panel Survey, respectively.[19]

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[19]Dominitz (1998) provides evidence that earnings expectations in the SEE are predictive of earnings realizations.

As additional evidence of the credibility of our earnings growth uncertainty measure we here relate the earnings growth density IQR to a different but related measure available for some SCE respondents: their self-reported monthly household income variability. Respondents in the triannual SCE Household Spending Survey are asked about the monthly variability in their household income, whether it on average varies month-to-month by less than 5%, between 5% and 15%, or by more than 15%. Table 5 shows that those who describe their income as more variable report significantly higher average earnings growth uncertainty, as well as higher average expected year-ahead earnings growth.

TABLE 5: Household Income Variability and Earnings Growth Expectations

How much does your hh income change from month to month ..	Avg Year-Ahead Exp. Earnings Growth	Avg Year-Ahead Earnings Growth Uncertainty
Vary by less than 5%	2.98	2.82
Vary between 5% and 15%	3.35***	4.91***
Vary by more than 15%	3.96***	5.77***

Note: The stars shows the significance of pairwise tests for equality of means against the group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4 Earnings growth and employment expectations over the career life-cycle

### 4.1 Life-cycle earnings growth expectations

We start our analysis by pooling our monthly data from June 2013 to December 2022 data and computing the average earnings growth expectations (represented by individual density means) by age. Binscatter regression estimates shown in Figure 2 show a more or less monotonically declining expected level of on-the-job wage growth, from an average level around 4% annually at age 25 to about 2% at age 65.[20] As indicated by the 25th and 75th percentiles of density means, there is considerable heterogeneity across workers in their expected earnings growth, especially at younger ages, where about a quarter of workers expect year-ahead on-the-job wage growth of at least 6%, while another quarter of respondents expects earnings growth less than 1%. At older ages this measure points to much lower levels of disagreement between respondents. These results are robust to adding controls for individual characteristics including education, race, gender, presence of a child under age 6, annual household income, self-employment, and the Census region of residence. Mean residuals from a regression of expected on-the-job wage growth on these

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Mueller et al. (2021) show that probabilistic expectations about future labor market transitions are strongly predictive of actual transitions, specifically from unemployment to employment. Using the SCE, Conlon et al. (2018) show that the expected number of offers over the next 4 months is positively correlated with the actual number of offers received 4 months later. They also find a high and significant positive correlation between the expected and actual salary of offers.

[20]Binscatter regression estimates were obtained using the Stata package binsreg, based on the methods developed by Cattaneo et al. (2019). Also shown in the figure are confidence bands.

characteristics, shown in Figure A5 of the Online Appendix, show very similar patterns as those in Figure 1. Interestingly, while the panel component of our data is limited to at most 12 monthly observations, within-person panel variation also indicate earnings growth expectations to decline with age.[21]

FIGURE 2: Average Earnings Growth Expectations over the Life Cycle
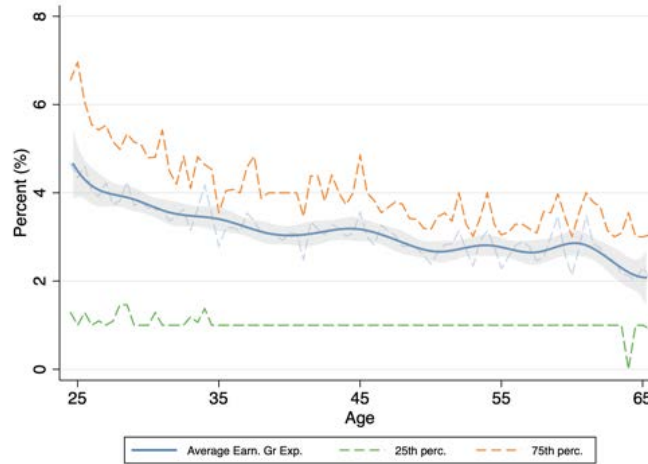
The life cycle pattern of workers' uncertainty about on-the-job wage growth, as measured by the density IQR) is shown in Figure 3a. Binscatter estimates reveal a sharp decline in average worker uncertainty in their late twenties, followed by a more gradual decline until age 55 after which it stabilizes.[22]

FIGURE 3: Earnings Growth Uncertainty over Working Life

**(A)** Average Uncertainty

(B) Tail Probabilities

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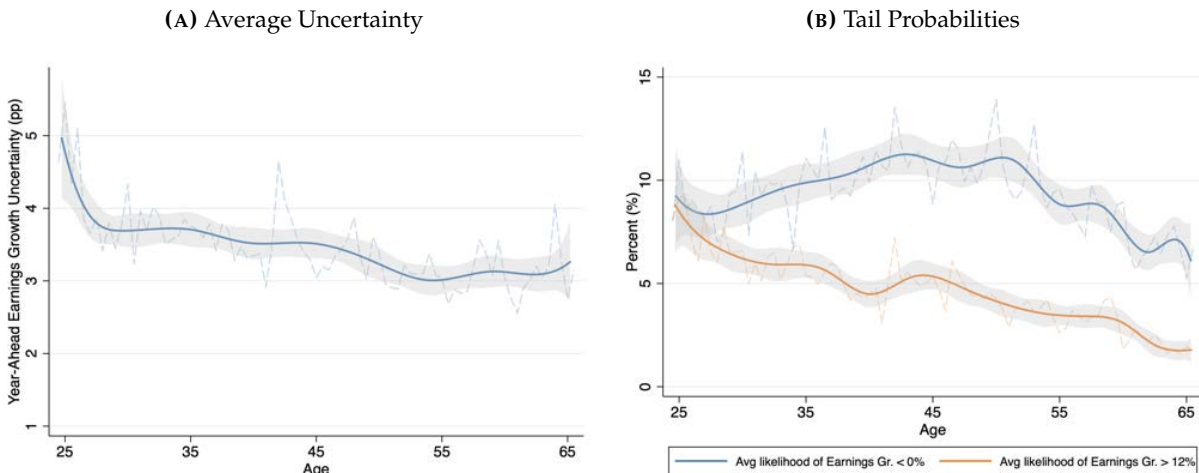
[21]When including age (measured in months) and individual fixed effects in the regression, the estimated coefficient on age is negative and statistically significant at the 1 percent level.

[22](Sabelhaus and Song, 2010) found a similar decline with age in realized annual earnings volatility.

More insight into this pattern of declining uncertainty with age is provided in Figure 3b which shows the average probability workers assign to a decline in earnings over the next year and the average probability of an earnings increase over 12% over the same time horizon. The former shows a relatively stable perceived risk of a wage cut, increasing only slightly from just under 10% to about 12% at age 50, after which we see a decline to approximately 7% at age 65. In contrast, the average probability of a large rise in earnings declines steadily with age, falling from about 8% at age 25 to 2% at age 65.

These trends suggest that the decline in uncertainty with age is driven mostly by a thinning of the upper tail of the year-ahead wage growth distribution.[23] This is confirmed in Figure 4 which shows the average year-ahead wage growth density, sometimes also referred to as the aggregate or "consensus" density, obtained by averaging the individual densities. The figure shows a gradual compression of the distribution due to a shrinking right tail. The associated decline in the variance of the average density can be decomposed into a change in the average uncertainty about future earnings growth and a change in disagreement, measured by the variance of the density means (Giordani and Söderlind, 2003; Bassetti et al., 2023).[24] This decomposition in our case indicates that 52% of the overall compression of the average density was due to a reduction in average uncertainty.

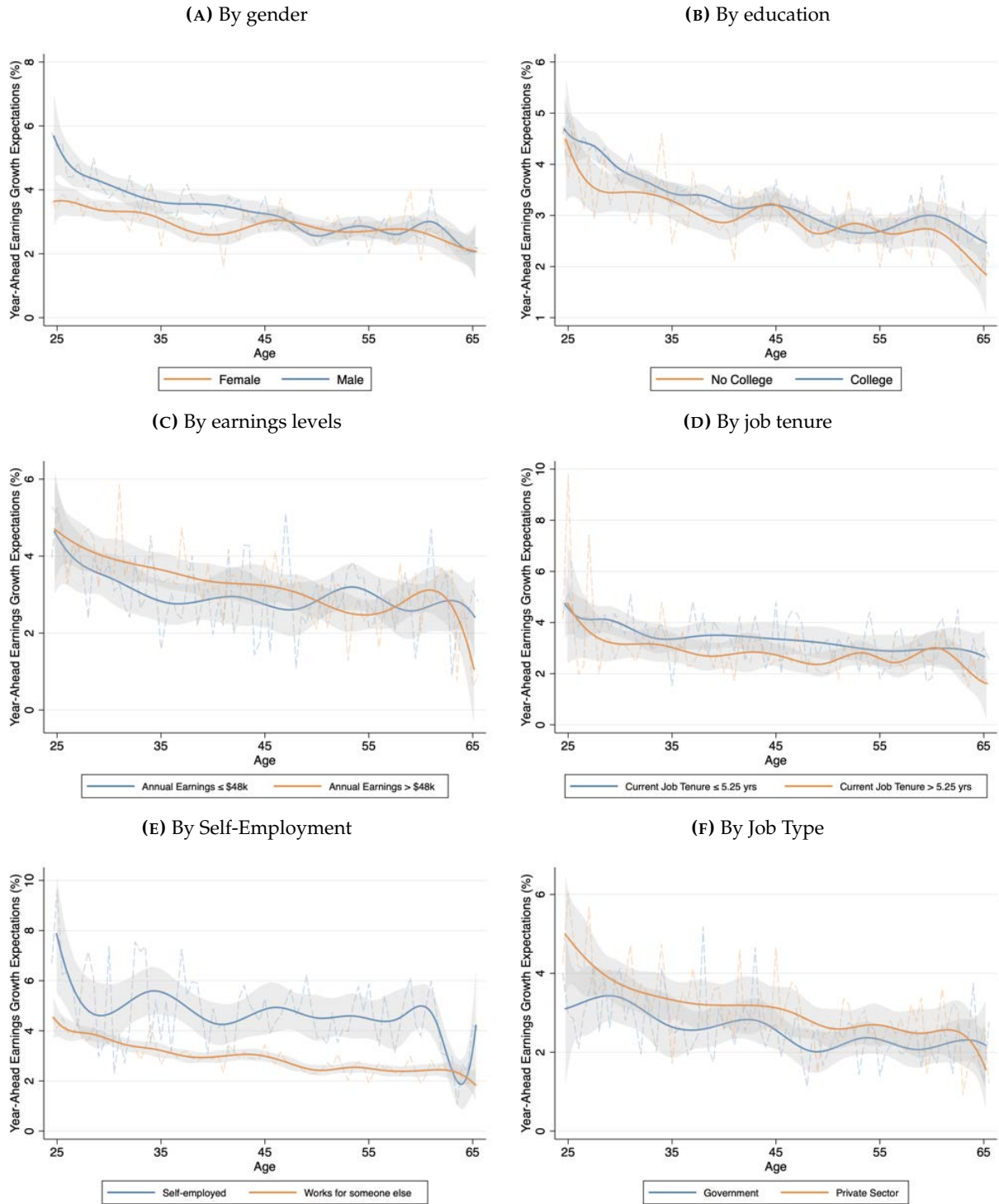**FIGURE 4:** Aggregate Earnings Growth Density over Working Life
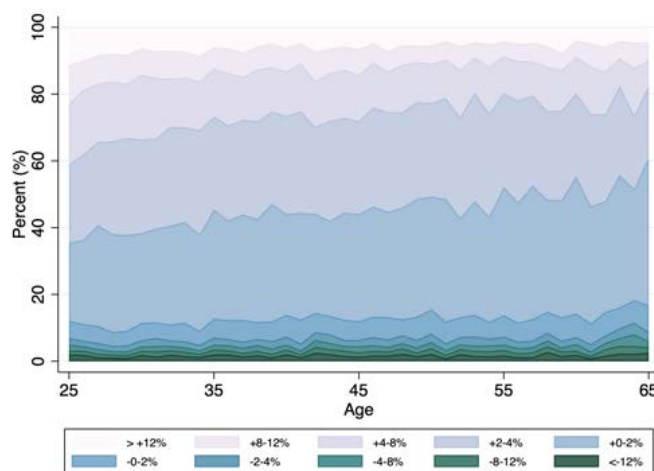
When distinguishing between different subgroups of workers, we generally see the same pattern of earnings growth expectations declining with age. However, there are some noticeable differences in levels. Panels a and b of Figure 5 show the evolution of wage growth expectations over the life cycle by gender and education. Male and college educated respondents report signif-

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[23]The trends in uncertainty and in tail probabilities are again robust to controls for observable characteristics. See Figures A6a and A6b in the Online Appendix.

[24]The variance of the consensus forecast (or "aggregate uncertainty") equals the sum of the average (individual) uncertainty (as measured by the density variance, instead of the density IQR) and disagreement among forecasters as measured by the variance of their density means.

icantly higher earnings growth expectations at younger ages, while they are comparable to their counterparts for those in their mid-forties or older.

FIGURE 5: Heterogeneity in Expected Earnings Growth over the Working Life

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Self-Employment

(F) By Job Type

Differentiating by earnings levels and job tenure, panels c and d of Figure 5 indicate somewhat

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higher wage growth expectations up to age 50 by those with above median annual earnings, but the differences are not statistically different. Similarly, we see somewhat higher wage growth expectations throughout the life cycle for those with less than the median job tenure (5 years and one quarter) compared to those with longer tenure levels, but the difference again is not statistically significant. In panels e and f of Figure 5 we differentiate by self-employment status and whether the respondent works in the government or private sector. Earnings growth expectations are significantly higher for self-employed workers throughout the life cycle and are also somewhat higher for those working in the private sector, but the difference in the latter is not statistically significant.[25]

Figure 6 presents similar heterogeneity analysis by worker and job characteristics but now for earnings growth uncertainty. Differentiating by gender, while largely similar, we see a sharp temporary increase in wage growth uncertainty among female respondents during their early forties. Wage growth uncertainty is significantly higher for those without a college degree, and for those with below-median levels of earnings. We see no statistically significant differences by job type and job tenure, but find much higher wage growth uncertainty for the self-employed.

When controlling for other observable worker characteristics, these life cycle patterns and differences largely remain, except for the disappearance of the temporary increase in wage growth uncertainty for female respondents in their forties (see Figure A8). Upon further examination we found that this was largely due to controlling for the presence of a child under age 6. Thus, the increase during the late 30s/early 40s in wage growth uncertainty among female respondents appears to be children-related.

4.2 Life-cycle employment expectations

Binscatter regression estimates of job loss and quit rate expectations, shown in Figure 7, reveal a remarkably steady expected probability of layoff (over the next 12 months) of around 14% over the life cycle until about age 55 after which the rate increases slightly to about 17%. The average reported quit probability instead shows a U-shape pattern, declining from about 27% at age 25 to about 16% between age 45, and rising from 16% at age 55 to about 28% at age 65. The pattern is again robust to controlling for composition changes with respect to a number of demographic variables (see Figure A9).

Comparing life cycle patterns in layoff risk by gender and education (panels a and b in Figure 8) we find largely comparable patterns, except for a generally higher layoff risk reported by those without a college degree at younger ages. When differentiating by earnings levels and job tenure in panels c and d, we find considerably lower average layoff risks reported by those with above-median earnings and job tenure levels. The same is true for those working in the government sector (panel e). While average layoff risks remain relatively constant over most of the working

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[25]These findings regarding the heterogeneity in life cycle expected earnings growth are largely robust to controlling for other worker characteristics, as seen in plots of average residuals in Figure A7 in the Online Appendix.

FIGURE 6: Heterogeneity in Earnings Growth Uncertainty over the Working Life

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Self-Employment

(F) By Job Type
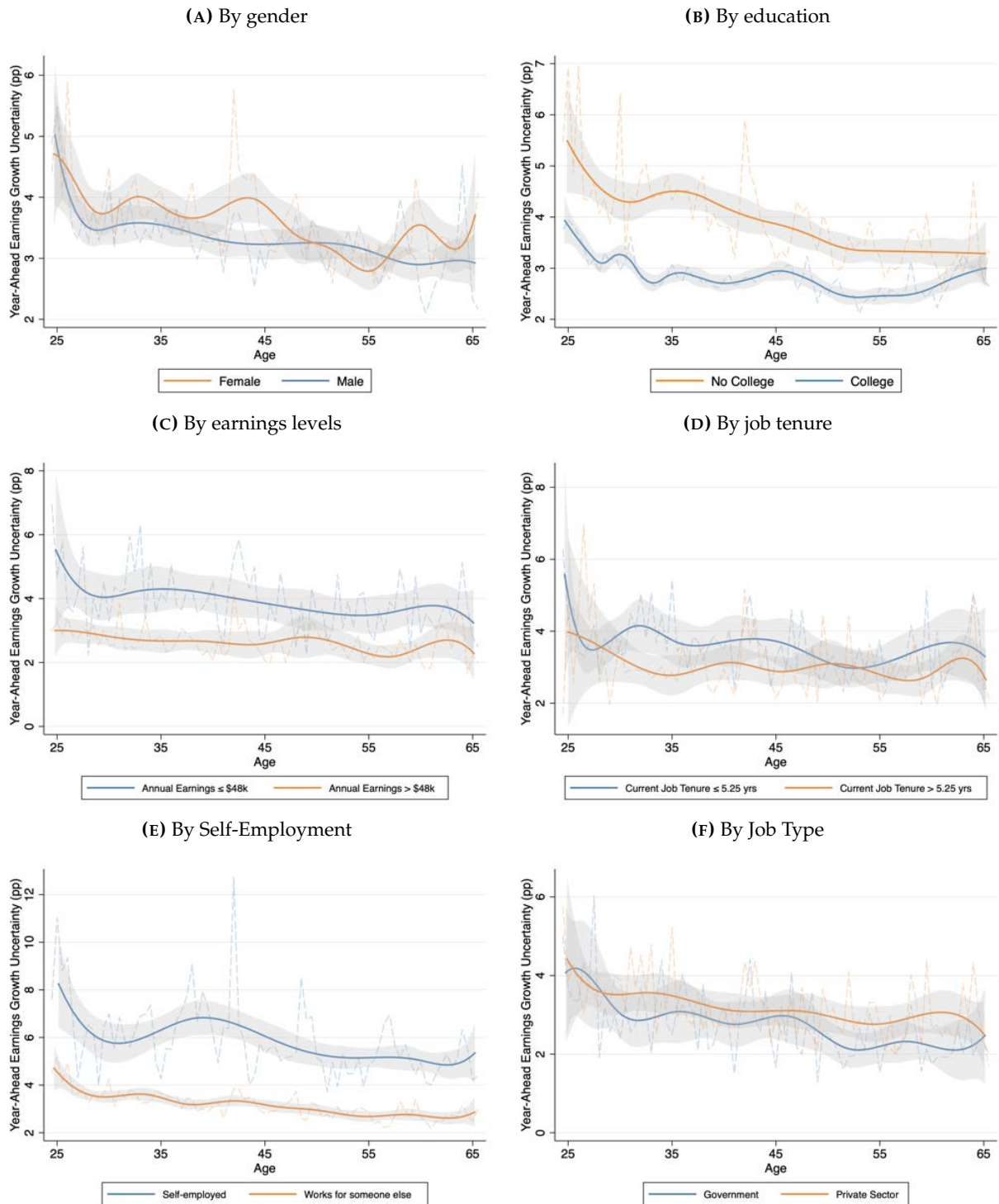
life in both sectors, those working in the private sector on average report a 4% higher annual layoff risk, compared to those in the government sector. As before, patterns for average residuals from a regression controlling for other worker and job characteristics are very similar (see Figure A10).

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**FIGURE 7:** Likelihood of Layoff and Quit over the Working Life
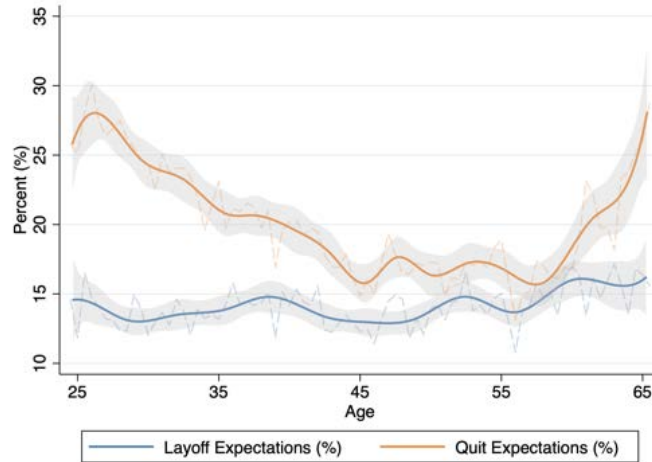
The U-shaped pattern of quit expectations over the working life show largely similar differences across worker characteristics as seen for layoff expectations. As shown in panel a of Figure 9, average quit probabilities are slightly higher for female respondents up until age 45, after which they follow a similar gradually increasing trend with male respondents approaching retirement ages. Average probabilities of leaving the job voluntarily over the next 12 months are higher for those with a college degree (panel b of Figure 9), and are significantly higher for those with below median-earnings (panel c) and below-median job tenure (panel d) through most of the working life. They are also higher for those working in the private sector (panel e), but the difference is not statistically significant.[26]

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[26]Patterns for average residuals from a regression controlling for worker and job characteristics are shown in Figure A11.

FIGURE 8: Heterogeneity in Layoff Expectations over the Working Life
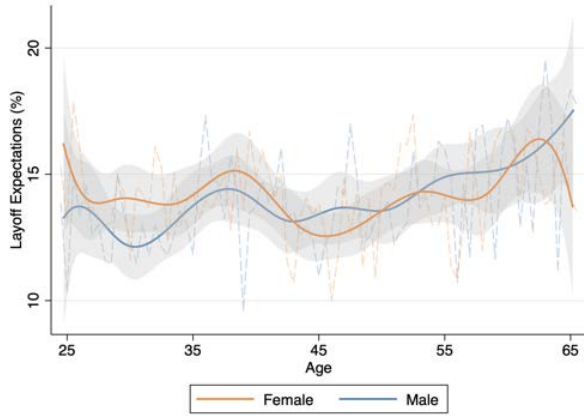
(A) By gender
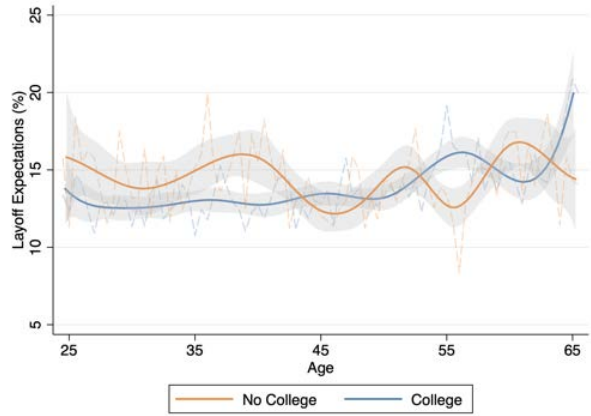
(B) By education

(C) By earnings levels
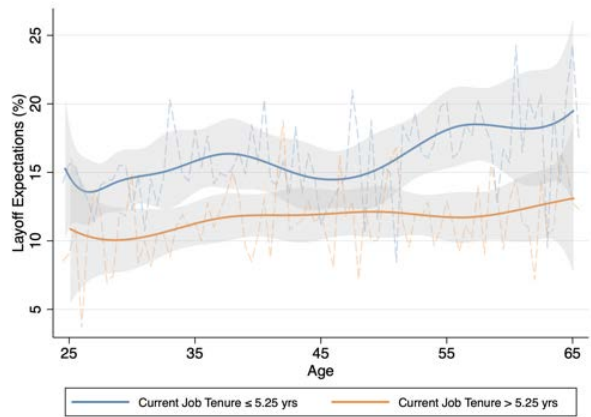
(D) By job tenure

(E) By Job Type

FIGURE 9: Heterogeneity in Quit Expectations over the Working Life

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Job Type
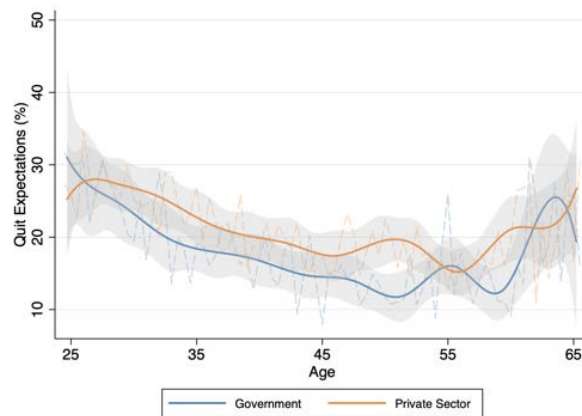
5 Earnings growth and employment expectations over the business cycle

5.1 Earnings growth expectations over the business cycle

How do perceived earnings growth and employment risk vary over the business cycle? We next consider expectations reported in the SCE since 2013, during the 2010s economic expansion and through the pandemic recession. Recall t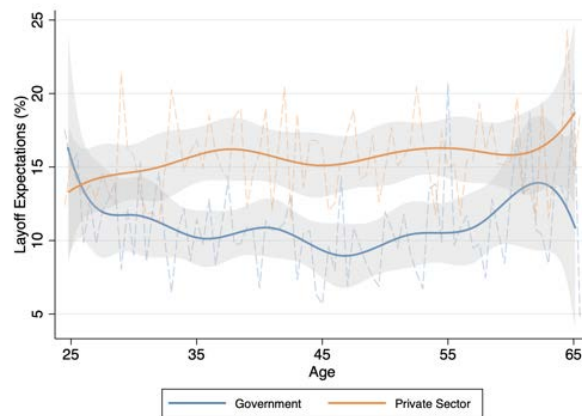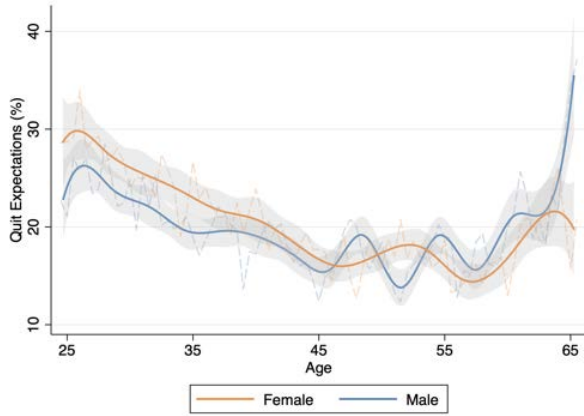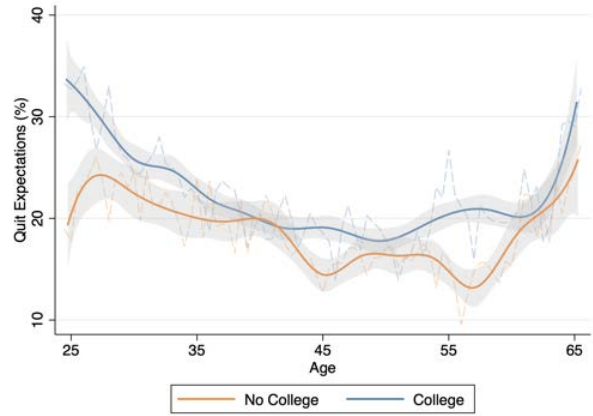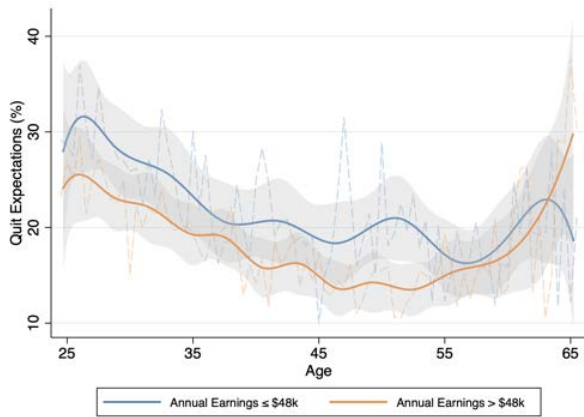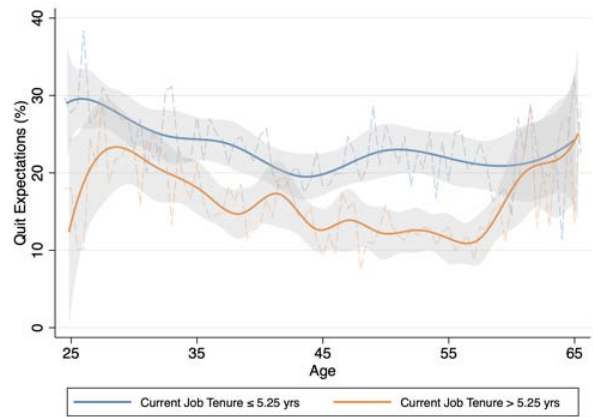hat the monthly sample of SCE respondents constitutes a representative sample of the adult population. Furthermore, because it constitutes a rotating panel, month-to-month variation largely represents changing beliefs reported by the same individuals.

FIGURE 10: Expected Earnings Growth over the Business Cycles
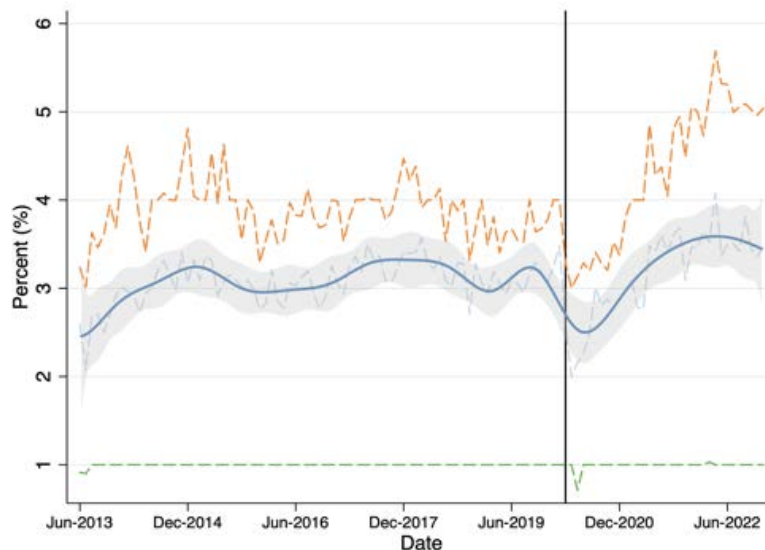
Figure 10 shows the initial rise and stabilization of average expected earnings growth leading up to the onset of the pandemic at which point earnings expectations first declined sharply, but then recovered to pre-pandemic levels by the end of 2021. Since then, with inflation and inflation expectations surging to levels above 9% and 6%, respectively, nominal wage growth expectations have increased only modestly to just above 3.5%. Interestingly, since June 2013 some 25% of respondents have reported expected earnings growth (density means) below 1% each month. In contrast, the 75th percentile indicates that while about a quarter of respondents reported expectations at or above 4% during 2020, by mid-2022 a quarter of respondents reported earnings growth expectations above 5%. This business cycle pattern is again robust to controlling for composition changes with respect to a number of worker characteristics (see Figure A12). As recessions usually imply large changes in the composition of the work force, with manual workers and Black, female and lower educated workers typically experiencing greater job losses, this robustness may

be somewhat surprising. However, it is in line with the fact that the pandemic recession was unusual, hitting especially workers in service industries and occupations requiring much social contact. Consequentially, the unemployment gap between different education and racial groups did not increase as much as one would have expected based on previous recessions.

As shown in Figure 11, the general evolution of average earnings growth expectations appears broad-based across worker and job characteristics, although levels generally are somewhat higher for male, college educated respondents, as well as those with low job tenure or working in the private sector or self-employed. Interestingly, the 2022 increase in average earnings growth expectations appears to be driven mostly by those in higher earning jobs. Patterns for average residuals from a regression controlling for the respondent's gender, race, having a college degree, having a young child, household income category dummies, Census region dummies, and age group dummies are very similar (see Figure A13).

Turning next to wage growth uncertainty, Figure 12a depicts the evolution of average earnings growth uncertainty, as captured by the average density IQR, since mid-2013. Average uncertainty has remained remarkably flat over this period, only showing a minor increase during the pandemic. This result is striking given the general increase in uncertainty about the pandemic's impact on the economy as well as the initial decrease in expected wage growth and the subsequent rebound. However, as shown in Figure 12b the relative stability of the IQR masks considerable movements in the average probability respondents assign to the extreme left tail of the earnings growth distribution. In particular, during the mid 2010s, the average probability of a decrease in nominal earnings fell from about 16% in June 2013 to about 8% in early 2018, but then it jumped back up temporarily to 12.5% at the start of the pandemic. In contrast, we see little movement in the right tail, with the average probability of a larger-than-12% earnings increase remaining relatively unchanged at about 5% over the same period.[27] This movement in the shape of the average density of year-ahead earnings growth can be seen in Figure 13. At the onset of the pandemic it shows an increase in the mass at the left tail and in the average probability of a small earnings increase of 0 to 2%. Respondents instead lowered the average probability of a more substantial 2% to 8% earnings increase. Applying the same decomposition of the average density, as in Section 4, indicates that 7.4% of the overall spreading out of the average density between February 2020 and August 2020 was due to an increase in average uncertainty.

Examining the evolution of earnings growth uncertainty by worker characteristics, Figure 14 shows that the overall relative stability of average expected earnings growth over the past decade masks meaningful increases in uncertainty during the pandemic for female and non-college educated workers and workers in the private sector.[28]

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[27]Figures A14a and A14b in the Online Appendix show similar patterns for regression-adjusted averages.

[28]Average residuals from a regression controlling for worker characteristics are shown in Figure A15.

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FIGURE 11: Heterogeneity in Expected Earnings Growth over the Business Cycle

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Self-Employment

(F) By Job Type
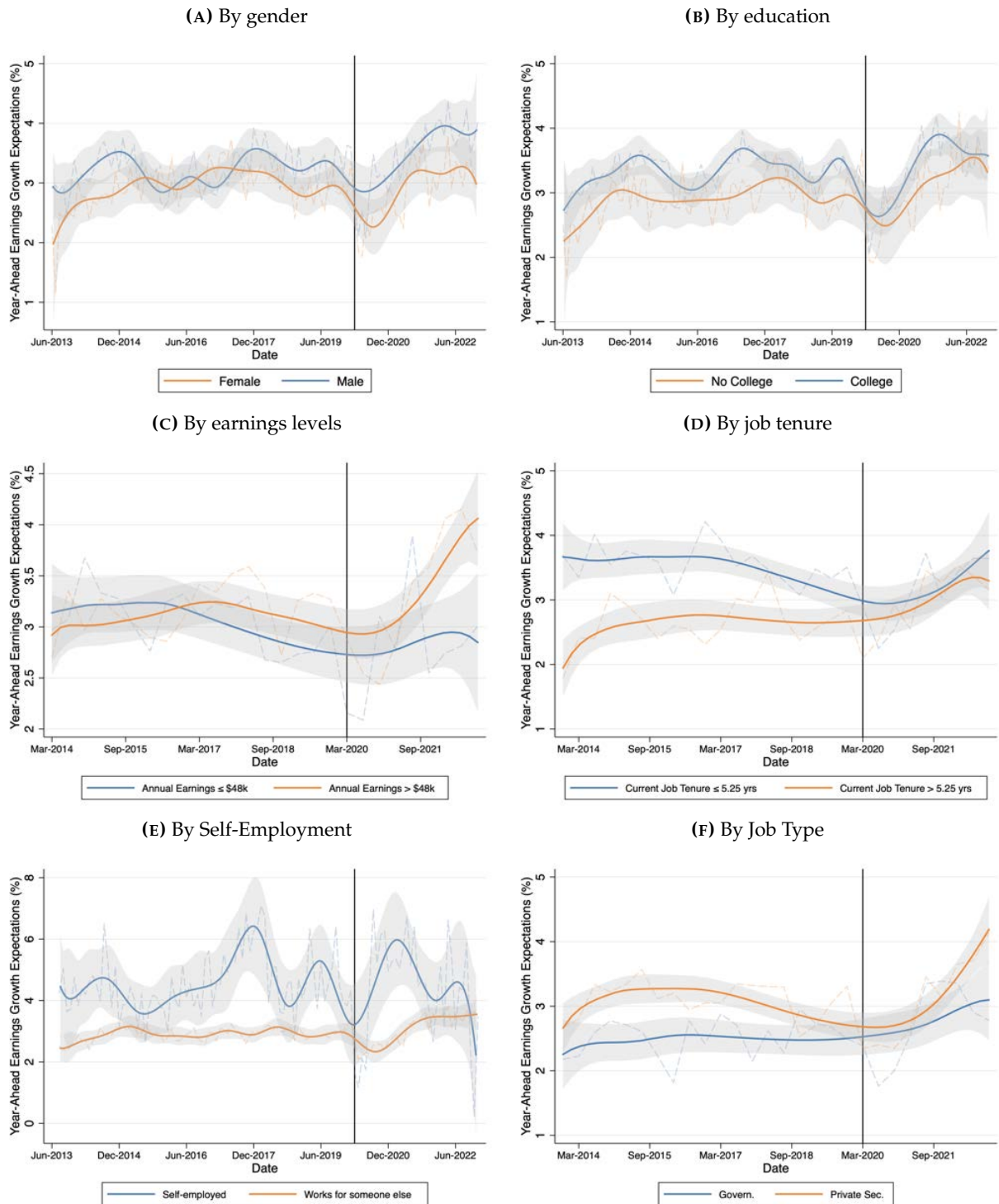
FIGURE 12: Earnings Growth Uncertainty over the Business Cycle

(A) Average Uncertainty

(B) Tail Probabilities
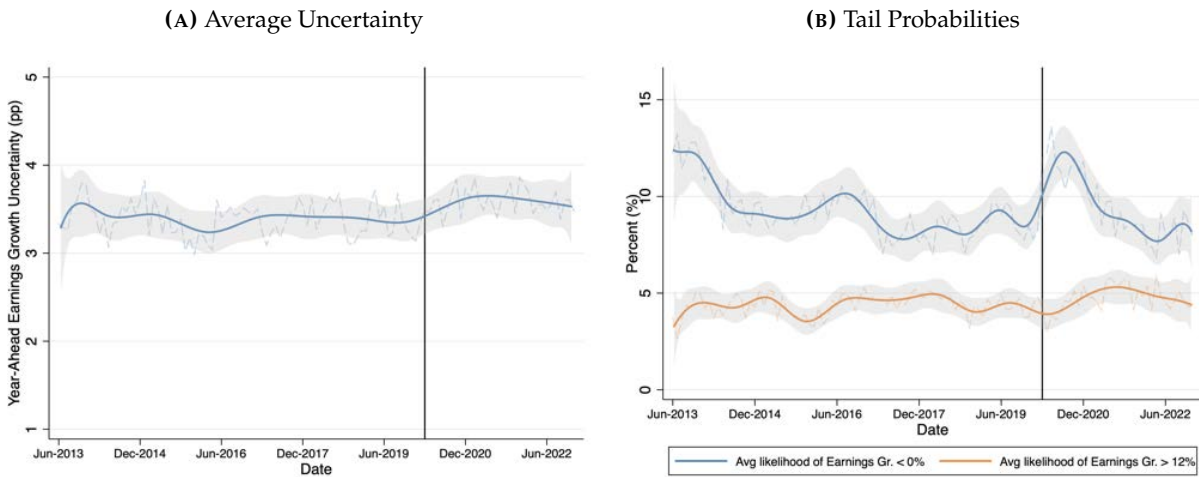
FIGURE 13: Aggregate Earnings Growth Density over the Business Cycle
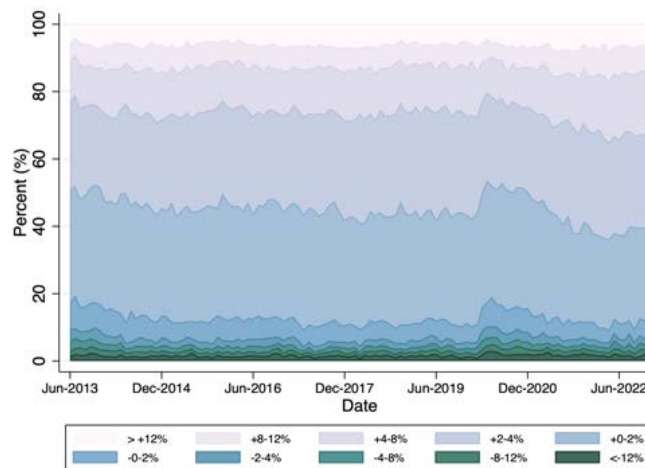
5.2 Employment expectations over the business cycle

Average layoff probabilities, shown in Figure 15 declined somewhat during the mid-2010s after which they stabilized at around 13.5%. As the pandemic hit, average job loss probabilities initially surged to 21%, but then fell steadily to levels well below those that prevailed before the pandemic, reaching 10.4% in April 2022 and 11.8% December 2022. Changes in average quit probabilities instead showed what looks like the mirror image of average layoff expectations, dropping sharply at the onset of the recession, then rebounding to levels just below pre-pandemic. Controlling for the changing sample composition of worker characteristics again somewhat surprisingly makes little difference for these general patterns (see Figure A16).[29]

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[29]Our results differ somewhat from those reported in Mueller and Spinnewijn (2023), who report largely stable job loss expectations during 2020, which they attribute to the fact that the unprecedented surge in realized job losses during the period was largely unexpected as well as the likely dynamic selection in the pool of workers over that period. Their

FIGURE 14: Heterogeneity in Earnings Growth Uncertainty over the Business Cycle

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Self-Employment

(F) By Job Type
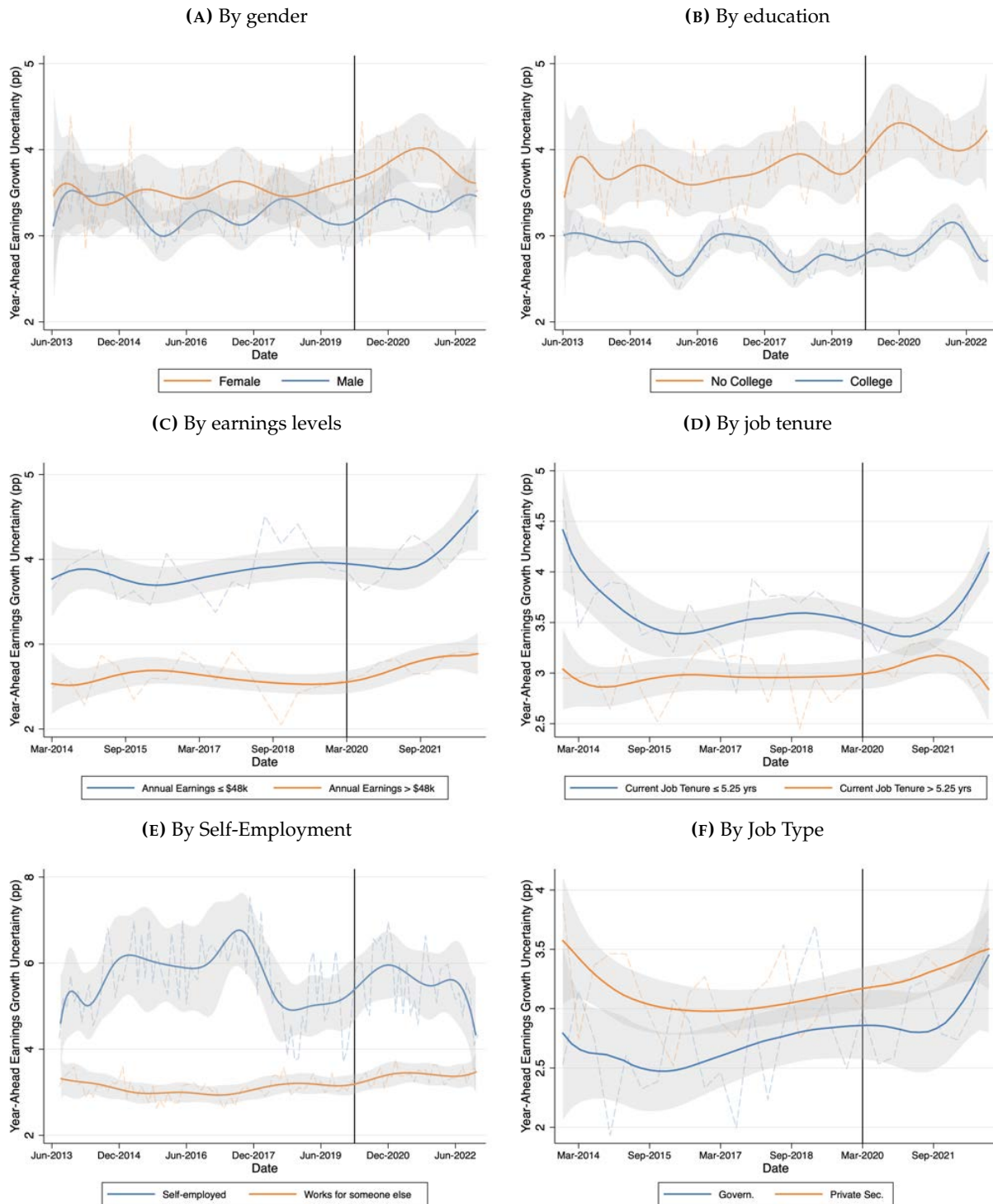
Analyzing the heterogeneity by worker characteristics in Figure 16, we generally find very similar patterns for average perceived layoff risk, except for generally higher levels of job loss

analysis appears to be based on annual averaged data.

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FIGURE 15: Likelihoods of Layoff and Quit over the Business Cycle
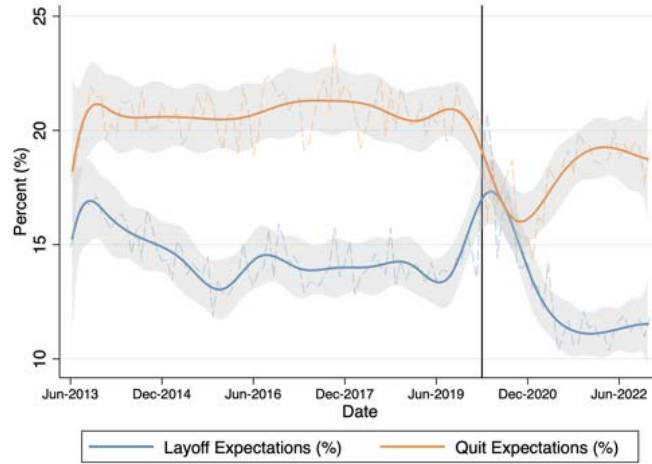
risk expressed by private sector workers, those with lower job tenure and lower current earnings levels. Controlling for changing worker characteristics over time, the results generally remain unaltered (see Figure A17), except that after adding controls, there no longer is as large of a layoff risk gap between those with below- and above-median earnings levels.

Turning finally to job quit expectations, Figure 17 shows differences by gender, education, industry, and job tenure, that are largely similar to those for layoff expectations. As shown in Figure A18 in the Online Appendix the patterns are robust to adding controls for worker characteristics.

FIGURE 16: Heterogeneity in Layoff Expectations over the Business Cycle

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Job Type
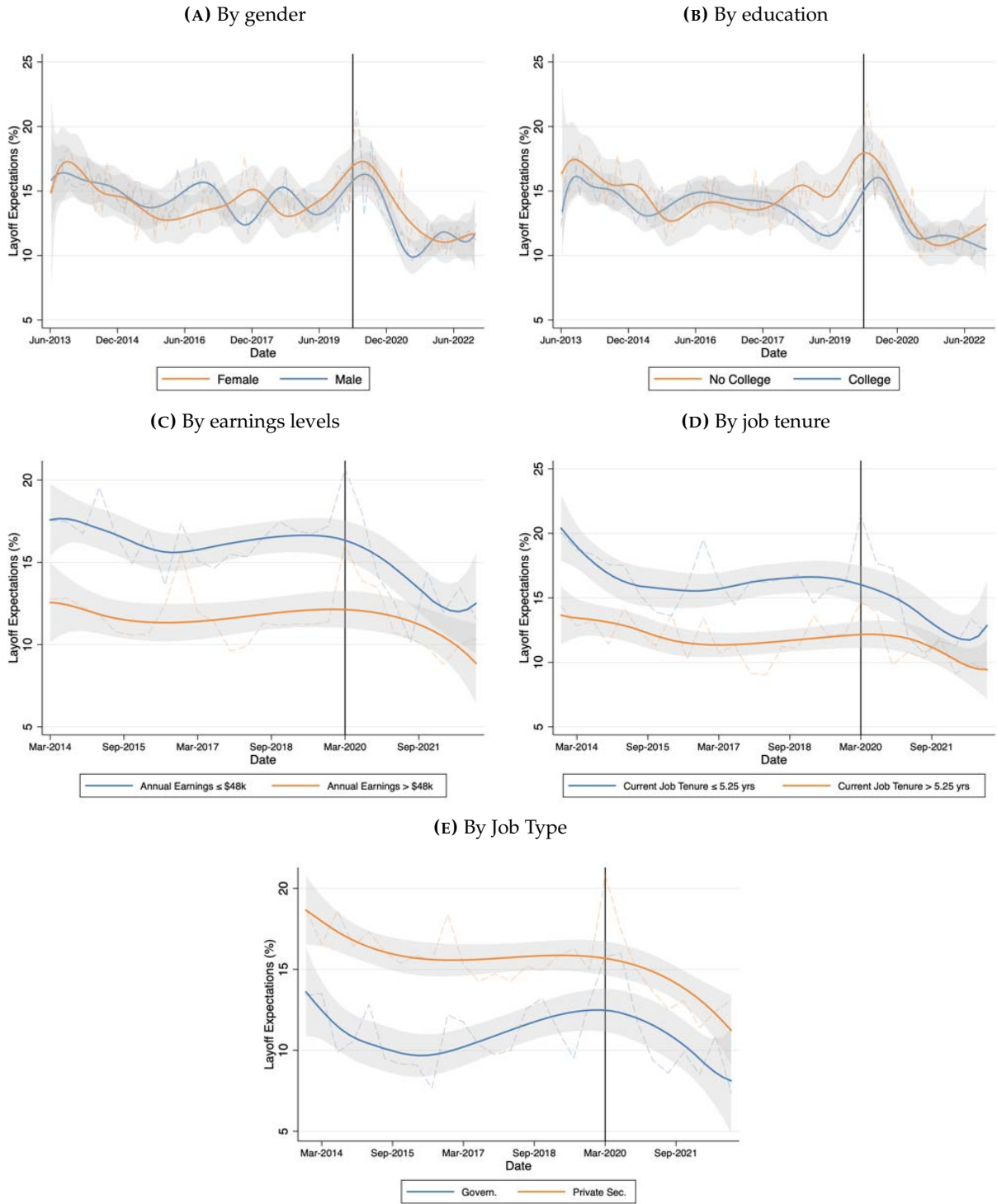
FIGURE 17: Heterogeneity in Quit Expectations over the Business Cycle

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Job Type
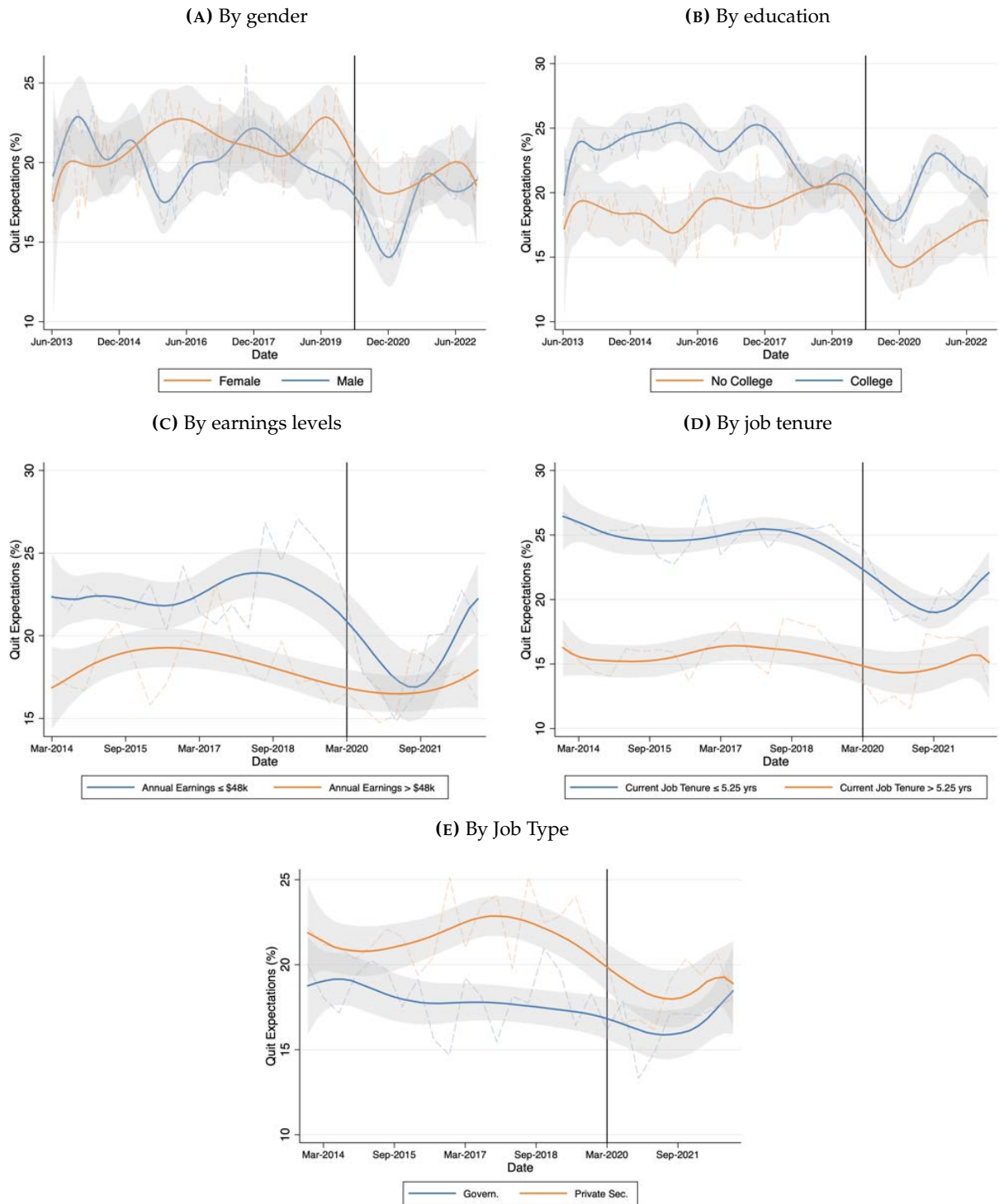
6 Covariation of earnings growth expectations with macroeconomic expectations

An interesting question regarding the evolution of earnings growth expectations over the business cycle concerns the extent to which this variation is related to evolving views about general macroeconomic conditions. Table 6 shows regression estimates relating respondents' earnings growth expectations to their contemporaneous expectations about one-year and three-year ahead inflation, the reported probabilities that the US unemployment rate, stocks, and the interest rate on savings accounts will be higher in 12 months, and the current state-level unemployment rate. We estimate a series of specifications in which we sequentially add time dummies, Census region dummies, demographic characteristics, and current earnings as additional controls.

We find year-ahead earnings growth expectations to be positively and statistically significantly associated with year-ahead inflation expectations, and with three-year ahead inflation expectations. Both relations, however, are relatively weak, implying a low expected pass through of overall price inflation to on-the-job wage inflation. For example, the results imply a 5 to 8 basis point increase in expected earnings growth on the job associated with a 100 basis point expected increase in inflation.

Earnings growth expectations are further positively and statistically significantly associated with the probability of higher stock prices and interest rates, and negatively related with the probability of higher year-ahead unemployment and with the actual current state unemployment rate. Relative to the association with inflation expectations, these relations are generally somewhat stronger. For example, a 10 percentage point increase in the probability that the unemployment rate will be higher a year from now, is associated with a 19 basis point decrease in expected earnings growth. Similarly a 10 percentage point increase in the probability that 12 months from now, average stock prices in the US stock market will be higher that they are now, is associated with a 15 to 17 basis point higher expected earnings growth.

When estimating the regression in differences, thereby controlling for individual fixed effects, the estimates in columns 4 and 5 of Table 6 are qualitatively similar but generally somewhat smaller, though remaining statistically and economically significant.

Tables 7 and 8 show similar estimates when relating reported layoff and quit probabilities to the same set of macroeconomic expectations, both in levels and in differences. While we do not find stable and statistically significant associations with expectations of one-year and three-year ahead inflation, layoff and quit probabilities are positively associated with expectations of higher unemployment, higher stock prices, and higher interest rates. These associations are both statistically significant and economically meaningful. Furthermore, layoff risks are strongly positively related to the current unemployment rate in the state of residence.

This new evidence supplements other recent findings on the relationship between subjective labor market beliefs and macroeconomic conditions. For example, Mueller and Spinnewijn (2023)

	(1) Earn. Gr. Exp.	(2) Earn. Gr. Exp.	(3) Δ Earn. Gr. Exp.	(4) Δ Earn. Gr. Exp.
1-yr ahead inf exp	0.081***	0.083***		
	(0.009)	(0.009)		
3-yr ahead inf exp	0.052***	0.058***		
	(0.009)	(0.009)		
% chance unemp higher	-0.019***	-0.019***		
	(0.001)	(0.001)		
% chance stock pr higher	0.017***	0.015***		
	(0.001)	(0.001)		
% chance int rate higher	0.010***	0.008***		
	(0.001)	(0.001)		
State unemp. rate	-0.096***	-0.010		
	(0.012)	(0.022)		
Δ 1-yr ahead inf exp			0.044***	0.044***
			(0.012)	(0.012)
Δ 3-yr ahead inf exp			0.023**	0.023**
			(0.011)	(0.011)
Δ % chance unemp higher			-0.004***	-0.004**
			(0.002)	(0.002)
Δ % chance stock pr higher			0.005***	0.004***
			(0.001)	(0.001)
Δ % chance int rate higher			0.003***	0.003***
			(0.001)	(0.001)
Δ state unemp. rate			-0.018	0.074
			(0.020)	(0.053)
Date Dummies		X		X
Region Dummies		X		X
Demographics		X		X
Dep. Var. Mean	3.115	3.124	-0.047	-0.047
R^2	0.031	0.055	0.005	0.009
Observations	88601	87458	62427	62122

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

find a clear and significant association between the monthly national unemployment and vacancy statistics and job finding expectations in the SCE for unemployed individuals as well as for employed individuals in case of job loss. They find a very similar relationship with the state unemployment rate, even after controlling for state fixed effects, as well as between job seekers' beliefs and their elicited expectations that the unemployment rate will rise, indicating, as we find here, that workers do take into account their own perceptions about aggregate conditions when forming their expectations.

While recent work has documented the sensitivity of a worker's earnings to current aggregate

TABLE 7: Expected Layoff Risk and Expectations about the Aggregate Economy

	(1) Pr(Layoff)	(2) Pr(Layoff)	(3) Δ Pr(Layoff)	(4) Δ Pr(Layoff)
1-yr ahead inf exp	-0.035	0.017		
	(0.027)	(0.028)		
3-yr ahead inf exp	0.071***	0.032		
	(0.027)	(0.027)		
% chance unemp	0.164***	0.163***		
higher	(0.004)	(0.004)		
% chance stock pr	0.007	0.012***		
higher	(0.004)	(0.004)		
% chance int rate	0.031***	0.036***		
higher	(0.004)	(0.004)		
State unemp. rate	0.617***	0.560***		
	(0.053)	(0.098)		
Δ 1-yr ahead			0.009	0.005
inf exp			(0.029)	(0.029)
Δ 3-yr ahead			0.001	0.003
inf exp			(0.024)	(0.024)
Δ % chance			0.056***	0.054***
unemp higher			(0.005)	(0.005)
Δ % chance			0.012**	0.011**
stock pr higher			(0.005)	(0.005)
Δ % chance			0.011**	0.012***
int rate higher			(0.005)	(0.004)
Δ state			0.299**	0.112
unemp. rate			(0.126)	(0.323)
Date Dummies		X		X
Region Dummies		X		X
Demographics		X		X
Dep. Var. Mean	14.020	13.992	0.009	0.005
R^2	0.049	0.071	0.007	0.012
Observations	79635	78595	56214	55937

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

economic conditions, to the performance of a worker's employer, and to the performance of the worker's industry (Guvenen et al., 2017), our results suggest an additional channel through which such exposures can affect behavior– through worker's expectations of future aggregate and local employment conditions.

TABLE 8: Quit Likelihood and Expectations about the Aggregate Economy

	(1) Pr(Quit)	(2) Pr(Quit)	(3) Δ Pr(Quit)	(4) Δ Pr(Quit)
1-yr ahead inf exp	-0.093***	-0.011		
	(0.032)	(0.032)		
3-yr ahead inf exp	0.062*	0.037		
	(0.033)	(0.032)		
% chance unemp higher	0.098***	0.098***		
	(0.005)	(0.005)		
% chance stock pr higher	0.075***	0.078***		
	(0.006)	(0.006)		
% chance int rate higher	0.068***	0.057***		
	(0.005)	(0.005)		
State unemp. rate	-0.267***	0.143		
	(0.059)	(0.119)		
Δ 1-yr ahead inf exp			0.024	0.022
			(0.029)	(0.029)
Δ 3-yr ahead inf exp			-0.034	-0.036
			(0.032)	(0.032)
Δ % chance unemp higher			0.018***	0.020***
			(0.006)	(0.006)
Δ % chance stock pr higher			0.029***	0.028***
			(0.006)	(0.006)
Δ % chance int rate higher			0.010**	0.009*
			(0.005)	(0.005)
Δ state unemp. rate			-0.078	0.277
			(0.089)	(0.282)
Date Dummies		X		X
Region Dummies		X		X
Demographics		X		X
Dep. Var. Mean	20.039	20.045	-0.006	-0.001
R^2	0.026	0.061	0.002	0.006
Observations	78975	77935	55713	55436

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

7 Dynamics of year-ahead wage growth expectations

Our access to repeated monthly observations for a given individual permits analysis of month-to-month variability in year-ahead wage growth expectations. Table 9 shows estimates of regressions relating wage growth expectations and wage growth uncertainty in period t to their value in t-1 as well as interactions between individual characteristics and the lagged value, controlling for time and region fixed effects. Estimates in columns 2 and 4 of Table 9 also control for individual

unobserved time-invariant characteristics. The estimates in columns 1 and 3 reveal a considerable amount of persistence in expectations and in uncertainty. In case of earnings growth expectations the persistence, as reflected in the coefficients on the lagged dependent variable, appears to be somewhat higher for respondents who are younger, male, white, have a college degree, and are self-employed. Persistence in wage growth uncertainty, instead, appears to be more stable over the life-cycle and higher for respondents who are female, non-white, without a college degree and not self-employed.

Estimates of regressions controlling for individual unobserved time-invariant heterogeneity indicate that this strong serial correlation in expected wage growth and wage growth uncertainty is almost fully captured by time-invariant idiosyncratic differences across individuals.[30] In case of earnings growth expectations there is some additional persistence (beyond that captured by the individual time-invariant heterogeneity) for college graduates and self-employed workers, while in case of earning growth uncertainty there is some added persistence for female respondents and those who are not self-employed.

8 Perceptions of persistence in earnings growth shocks

Our focus so far has been on expectations about year-ahead earnings growth, but individuals' consumption and work decisions also depend on their longer-term earnings growth expectations and on the perceived persistence of future wage growth shocks. To that end, we first investigate the relation between earnings growth expectations at different horizons. Next, we analyze the perceived persistence of earnings shocks. Finally, in Section 9, we examine how expected spending growth is related to the expected earnings growth.

To analyze the relationship between short and medium-term wage growth expectations we elicited, as part of the July and September 2022 SCE core surveys, respondents' expectations about two-year and three-year ahead wage growth in the form of point forecasts.[31] In the top panel of Table 10 we relate these expectations to each other and to one-year ahead point forecasts.[32] We find a relatively strong positive correlation of 0.68 between one-year and two-year expectations, 0.55 between one-year and three-year ahead expectations, and an even stronger correlation of 0.77 between two-year and three-year ahead expectations.

As we have two observations for a subset of our respondents, we can also compute the correlations between changes in expectations at each of the three horizons, which accounts for individual fixed effects. As shown in the bottom panel of Table 10 we find estimated correlations to

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[30]In case of wage growth uncertainty this finding is consistent with the earlier findings in Bruine de Bruin et al. (2011).

[31]More specially, in the July 2022 survey we asked respondents by how much they expect their earnings to change over the 12-month period between July 2023 and July 2024 and over the 12-month period between July 2024 and July 2025, assuming they will continue to work over these periods.

[32]The one-year ahead point forecast is elicited in a similar manner, asking the respondents to assume they will continue to work over the next year.

TABLE 9: Variability in Earnings Growth Expectations

	(1) Exp. Earnings Gr.	(2) Exp. Earnings Gr.	(3) Earnings Gr Uncert.	(4) Earnings Gr Uncert.
Lagged Earn Gr Exp	0.47***	0.08		
	(0.03)	(0.06)		
Lagged Exp. Earn.	-0.04**	-0.01		
Gr.× Female	(0.02)	(0.04)		
Lagged Exp. Earn.	0.09***	0.09**		
Gr.× College grad	(0.02)	(0.04)		
Lagged Exp. Earn.	-0.05**	-0.08		
Gr.× Age ∈ (35,45]	(0.02)	(0.05)		
Lagged Exp. Earn.	-0.06***	-0.09		
Gr.× Age ∈ (45,55]	(0.02)	(0.05)		
Lagged Exp. Earn.	-0.07***	-0.10*		
Gr.× Age ∈ (55,65]	(0.02)	(0.05)		
Lagged Exp. Earn.	0.10***	0.11**		
Gr.× Self-employed	(0.02)	(0.05)		
Lagged Exp. Earn.	0.07***	0.04		
Gr.× White	(0.02)	(0.05)		
Lagged Uncertainty			0.74***	0.08
			(0.02)	(0.05)
Lagged Earn. Gr.			0.05***	0.05
Uncert.× Female			(0.01)	(0.03)
Lagged Earn. Gr.			-0.09***	0.00
Uncert.× College grad			(0.01)	(0.04)
Lagged Earn. Gr.			-0.02	-0.03
Uncert.× Age ∈ (35,45]			(0.02)	(0.05)
Lagged Earn. Gr.			-0.00	-0.02
Uncert.× Age ∈ (45,55]			(0.02)	(0.04)
Lagged Earn. Gr.			-0.01	-0.00
Uncert.× Age ∈ (55,65]			(0.02)	(0.05)
Lagged Earn. Gr.			-0.04**	-0.14**
Uncert.× Self-employed			(0.02)	(0.06)
Lagged Earn. Gr.			-0.08***	0.05
Uncert.× White			(0.01)	(0.04)
Demogr.	X	X	X	X
Individual time-invariant heterogeneity		X		X
Dep. Var. Mean	3.11	3.11	2.95	2.95
R^2	0.33		0.51	
R^2 overall				
Observations	63741	63741	63741	63741

Note: Columns 1 and 3 show OLS estimates. Columns 2 and 4 are estimated using the Arellano-Bond estimation procedure. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

be somewhat smaller. While these correlations account for individual unobserved time-invariant heterogeneity in beliefs, the correlations may still reflect time-varying shocks, such as a temporary increase in general optimism or pessimism, that simultaneously affect expectations at all horizons.

Accordingly, we analyze the perceived persistence of shocks in two alternative ways. First, we use a set of strategic survey questions to assess the perceived relationship between past-year and

TABLE 10: Correlation Matrix of Earnings Growth Expectations at Different Horizons

	Exp. year-ahead earnings gr.	Exp. 2 year-ahead earnings gr.	Exp. 3 year-ahead earnings gr.
Exp. year-ahead earnings gr.	1.00	.	.
Exp. 2-year-ahead earnings gr.	0.68***	1.00	.
Exp. 3-year-ahead earnings gr	0.55***	0.77***	1.00
	Diff in exp. year-ahead earnings gr.	Diff in exp. 2 year-ahead earnings gr.	Diff in exp. 3 year-ahead earnings gr.
Diff in exp. year-ahead earnings gr.	1.00	.	.
Diff in exp. 2-year-ahead earnings gr.	0.46***	1.00	.
Diff in exp. 3-year-ahead earnings gr	0.36***	0.65***	1.00

year-ahead earnings growth shocks. Second, we elicit an individual's subjective joint distribution of one-year and two-year ahead earnings growth.

8.1 Strategic survey questions

The goal of our strategic survey questions is to evaluate the impact of specific earnings growth shocks in one period on an individual's beliefs about earnings growth in the subsequent period. To investigate this, we designed a so-called "within subject" experiment in which respondents receive different "treatments". This experiment was included as part of the July and September 2022 SCE Labor Market Surveys. Individuals in the survey were first asked for their past-year earnings growth as well as their point forecast for year-ahead and two-years-ahead earnings growth. In each treatment we then ask respondents to consider different scenarios for realized earnings growth over the past year.

More specifically, in case of the first scenario the respondent is asked: *"What if in the past year your annual earnings had increased by x+2% instead of x%"*, where *x* was their reported past-year increase in earnings.[33] The respondent was then asked *"Under this scenario, would the increase you expect in your earnings for the next 12 months be different from the [X] percent you reported earlier?"*. A follow-up question then asks by how much the respondent would change her expectation, if any. Respondents are then similarly asked if and by how much they would revise their earnings growth expectations for the subsequent year (so two years ahead).[34]

In addition to the scenario of a 2 percentage point higher earnings growth, we also asked about the scenario where past-year earnings growth had been 2 percentage points lower. This "within-subject" experiment, in which the same respondent is exposed to different treatments, permits identification of the treatment effects at the individual level, thereby controlling for unobserved

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[33]We used appropriately adjusted language for those who reported a decrease or no change in their earnings over the past year.

[34]As explained in Online Appendix B, in the September survey we randomly assigned two different formats for answering the follow-up question. As we did not find any statistically significant difference, we here report results from the pooled sample.

heterogeneity. At the same time, in our controlled experimental setting results are not affected by time-varying unobserved factors that may affect other measures based on panel regressions. This is an important advantage of this experimental approach – it enables the identification of causal effects of an earnings growth shock in one period on expected earnings growth in the next period.

Results from the experiment are shown in Table 11. The average revision in expected year-ahead earnings growth associated with the treatment of a 2 percentage point lower earnings growth over the past year is a statistically significant -0.10 percentage points, with average revisions ranging between -0.22 and -0.14 for respondents aged 35 to 45 and with a college degree, and +0.01 for respondents below age 35. Average revisions in two-year ahead earnings growth expectations are even smaller in absolute magnitude, with an overall average statistically insignificant revision of -0.04 percentage point.

TABLE 11: Revisions in 1-year and 2-year ahead expected earnings growth

|	If earnings growth in past year was 2pp lower		If earnings growth in past year was 2pp higher	
	Mean Rev in 1-yr Ahead Exp. Earn. Gr.	Mean Rev in 2-yr Ahead Exp. Earn. Gr.	Mean Rev in 1-yr Ahead Exp. Earn. Gr.	Mean Rev in 2-yr Ahead Exp. Earn. Gr.
Overall	-0.10**	-0.04	0.21***	0.22***
Female	-0.07	-0.06	0.24***	0.22***
Male	-0.13**	-0.03	0.18***	0.23***
College	-0.14***	-0.07**	0.17***	0.19***
No College	-0.07	-0.02	0.23***	0.25***
White	-0.10**	-0.03	0.19***	0.22***
Non-white	-0.10	-0.12	0.30***	0.27***
Married	-0.12**	-0.05	0.19***	0.21***
Single	-0.06	-0.01	0.25***	0.25***
Self-employed	-0.16	-0.12	0.13	0.06
Not self-emp.	-0.09**	-0.03	0.21***	0.24***
Age $\leq$ 35	0.01	0.08	0.42***	0.39***
$35 <$ Age ≤ 45	-0.22***	-0.09	0.10	0.16***
$45 <$ Age ≤ 55	-0.03	-0.02	0.14*	0.13**
$55 <$ Age ≤ 65	-0.15*	-0.14	0.20**	0.24**

Note: The stars show whether mean revisions are statistically significantly different than 0. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

For the treatment of a 2 percentage point higher earnings growth over the past year, we find somewhat larger average effects. We find average revisions in one-year and two-year ahead earnings growth expectations of, respectively, statistically significant increases of 0.21 and 0.22 percentage points. We again see some heterogeneity in responses, with female, non-college, non-white and respondents aged under 35 on average reporting somewhat larger positive revisions.

Figure 18 shows that the majority of respondents do not revise in either scenario. Those who do revise generally make relatively small revisions, although some respondents appear to expect strong persistence in the growth shock, while others expect the shock to be fully undone in the

subsequent year. As shown in Figure A19, the distributions in the revisions of two-year ahead earnings growth expectations are very similar.

FIGURE 18: Distribution of revisions in 1-year ahead earnings growth expectations

(A) If earnings growth in past year was 2pp lower

(B) If earnings growth in past year was 2pp higher
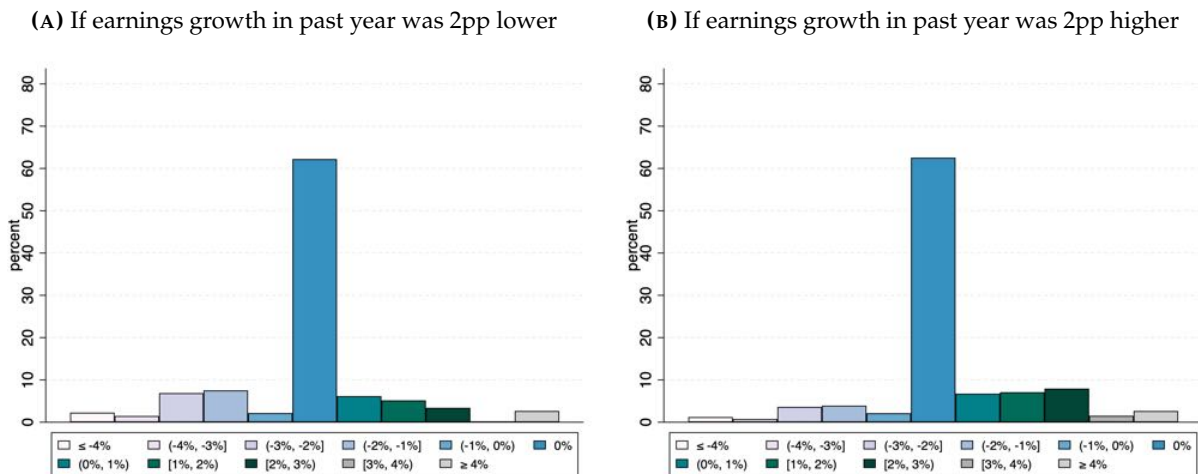
Given the magnitude of the shocks, the overall results imply a relatively small auto-correlation in earnings growth shocks, with one-year and two-year ahead expectations increasing by about 0.1 percentage point for a 1 percentage point positive earnings growth shock in the previous period, and an even smaller response of 0.05 percentage point to a negative earnings growth shock. At first glance, our finding appears in line with Guvenen and Smith (2014) who find realized income shocks to be not very persistent. In addition, our results point to a slight asymmetry in the proportion of respondents expecting mean reversion after positive and negative earnings growth shocks. We observe that while around 17% of the respondents expect a form of mean reversion after a negative shock, only around 11% expect a subsequent negative revision in earnings growth after a positive shock. Finally, we interpret the small average response in expectations to past earnings growth shocks as respondents considering the evolution of their earnings to be close to a random walk, on average.

8.2 Elicitation of joint distribution of one-year and two-year ahead wage growth

Our second approach to measuring persistence or serial correlation in earnings growth is through the elicitation of the joint density of one-year and two-year ahead earnings growth. We do this by eliciting the marginal density of year-ahead earnings growth and the density of two-year ahead earnings growth expectations conditional on one-year ahead earnings growth realizations. To elicit the marginal density of year-ahead earnings growth we asked respondents in the May 2022 survey, the following version of the SCE core survey density question discussed in section 3.[35]

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[35]We experimented across the survey waves with the bin widths. The details are explained in Online Appendix B.

Please think again about the year ahead, and assume that you will continue to work over the next year. In your view, what would you say is the percent chance that 12 months from now ...
Your earnings, before taxes and deductions will have ...

increased by 5% or more	_____	*percent chance*
increased by 3% to 4.99%	_____	*percent chance*
increased by 1% to 2.99%	_____	*percent chance*
increased by less than 1% or decreased	_____	*percent chance*
Total	100	

To elicit the conditional density of two-year ahead earnings growth, respondents are then told *"In the next few questions we are interested in what you expect to happen to your annual earnings two years from now, that is between May 2023 and May 2024, under four different scenarios."* They are then sequentially asked to imagine four different scenarios, starting with *"imagine that your annual earnings increase by less than 1% or decrease over the next 12 months"*, followed by *"Next, imagine that your annual earnings increase by between 1% and 2.99% over the next 12 months"*, and similarly for past earnings growth of between 3.0% and 4.99% and growth by 5% or more. For each scenario, they are asked to report the percent chance that their earnings growth between May 2023 and May 2024 will fall into each of the same four intervals.[36] In contrast to the backward-looking scenarios in the strategic survey questions, the outcomes we condition on in the conditional distribution are forward-looking.

In the September and December SCE surveys we repeated the two questions but with a more refined, and a more respondent-specific set of bins for eliciting the density of year-ahead earnings growth. More specifically, in the September survey instead of 4 we asked about 5 earnings growth bins: negative growth; growth between 0% and 1.99%, between 2% and 3.99%, between 4% and 7.99% and 8% or more. In the December survey we instead adopted an unfolding bracket approach with bins tailored to the respondent's initial point forecast for year-ahead earnings growth, and with a bin with more than 50% probability split into two. As the overall results based on the three samples were very similar, we here only report the pooled May-September-December sample results.[37]

Multiplying the marginal and conditional probabilities reported by an individual yields the interval probabilities of the joint distribution of one-year and two-year ahead earnings growth. To compute the correlation coefficient at the individual level from the joint distribution requires an assumption about the functional form of the joint distribution within each 2-dimensional bin. We assume the joint distribution to be bivariate normal. We also compute the correlation for each respondent assuming, as an approximation, that the within-bin distribution is discrete with a single mass point at the interval midpoint. The results from this discrete approximation are

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[36]When filling in each row for a given scenario, respondents are reminded that the percentages in that row should add up to 100%.

[37]More details are provided in Online Appendix B. Separate results for each survey wave are available on request from the authors.

largely similar to the results for the bivariate normal specification and are reported in Online Appendix B.

Table 12 reports a 0.09 average correlation between one-year and two-year ahead earnings growth across respondents assuming joint normality, while the median is 0.02. This result suggests that workers consider the evolution of their earnings as close to a random walk plus independent shock, which is the canonical model of realized earnings dynamics in the literature. There is some modest variation in serial correlation by demographic characteristics, with those for college graduates being somewhat larger at an average of 0.12.[38] As shown in Online Appendix Table B1, the average estimated correlation based on a discrete specification also was 0.09.

TABLE 12: Individual-level Correlations between 1-year and 2-year Ahead Expected Earnings Growth

|	Mean	Std. Dev.	p10	Median	p90
Overall	0.092	0.43	-0.42	0.02	0.75
Female	0.073	0.46	-0.49	0.01	0.78
White	0.099	0.43	-0.42	0.02	0.76
Married	0.100	0.44	-0.44	0.03	0.79
College graduate	0.118**	0.42	-0.40	0.04	0.75
$35< \text{Age} \leq 45$	0.084	0.40	-0.33	0.01	0.70
$45< \text{Age} \leq 55$	0.081	0.46	-0.49	0.01	0.81
$55< \text{Age} \leq 65$	0.057	0.45	-0.48	0.00	0.78
Has child under age 6	0.136	0.45	-0.46	0.09	0.72
Working FT	0.096	0.44	-0.42	0.03	0.76
Self-employed	0.085	0.44	-0.53	0.00	0.66

Note: The stars shows the significance of pairwise tests for equality of means between the group that is shown and the opposite group. For age groups, the tests are against the group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 19 shows the relative frequency distribution of these computed correlation coefficients. There is a large mass around zero, representing 18 percent of respondents, with another 37% with correlations within the -0.25 to 0.25 range, another 13% perceiving a perfect positive auto-correlation, and the remainder spread across the rest of the -1 to 1 range, including some respondents expecting some mean reversion in their earnings growth.

Consistent with our findings based on the strategic survey questions, these results point to relatively low average perceived persistence in earnings growth shocks.

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[38]This difference is not statistically significant when we simultaneously control for all the worker characteristics as shown in the first column of Table A2. The estimates in that table also show that those with higher year-ahead earnings growth expectations or higher earnings growth uncertainty on average perceive a lower correlation between 1-year and 2-year ahead earnings growth realizations.

FIGURE 19: Histogram of Individual Level Correlations between the 1-year and 2-year Ahead Earnings Growth
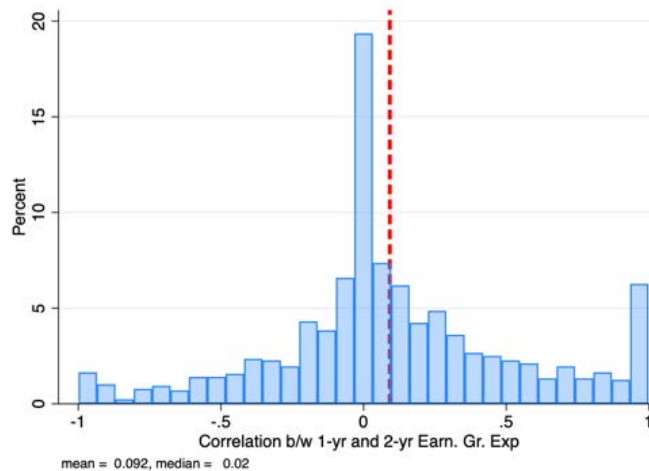
Note: The red dashed line shows the weighted mean of the individual-level correlations.

9 Perceived association between future earnings and spending growth

Having examined the perceived persistence in earnings growth shocks, we now analyze workers' perceptions of the covariation between future earnings and spending growth. To do so we elicit the subjective joint distribution of one-year ahead earnings and spending growth using the same approach as described in the previous section.

As shown in Table 13 the average of the individual correlations is 0.16, while the median is 0.10. When considering the overall distribution of individual correlations in Figure 20, we see a considerable mass at 0, and a long right tail. When comparing different demographic groups in Table 13, there is some modest variation in the perceived correlation between future earnings and spending growth, with married respondents, those with a college degree and those working full-time envisioning a somewhat stronger correlation between year-ahead earnings and spending changes. Self-employed individuals and non-white respondents instead report a considerably lower correlation. These differences are mostly robust to controlling for worker characteristics simultaneously, as shown in Table A3.

It is important to interpret the magnitude of the average correlation of 0.16 between future earnings and spending growth in the context of the perceived persistence of year-ahead earnings shock. The results in the previous section imply that respondents expect little persistence in earnings growth shocks. In terms of the earnings process, however, the apparent lack of a reversion to the mean, which would generate negative serial correlation in earnings growth shocks, implies that workers on average see earnings changes as largely permanent.

Finally in Table 14 we relate the estimated individual correlations to the individual's expected earnings growth, earnings growth uncertainty and the reported risk of layoff and quit. While

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TABLE 13: Individual-level Correlations between 1-year Ahead Expected Earnings and Spending Growth

	Mean	Std. Dev.	p10	Median	p90
Overall	0.162	0.40	-0.22	0.10	0.78
Female	0.149	0.43	-0.33	0.11	0.81
White	0.173**	0.41	-0.21	0.12	0.79
Married	0.180**	0.41	-0.21	0.12	0.79
College graduate	0.200***	0.38	-0.13	0.15	0.76
$35 < $ Age ≤ 45	0.161	0.38	-0.20	0.08	0.79
$45 < $ Age ≤ 55	0.167	0.42	-0.23	0.10	0.81
$55 < $ Age ≤ 65	0.222*	0.41	-0.13	0.11	0.88
Has child under age 6	0.200	0.39	-0.20	0.16	0.82
Working FT	0.177***	0.40	-0.21	0.12	0.79
Self-employed	0.081*	0.49	-0.57	0.00	0.70

Note: The stars shows the significance of pairwise tests for equality of means between the group that is shown and the opposite group. For age groups, the tests are against the group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

FIGURE 20: Histogram of Individual Level Correlations between the 1-year Ahead Earnings and Spending Growth

mean = 0.162, median = 0.10
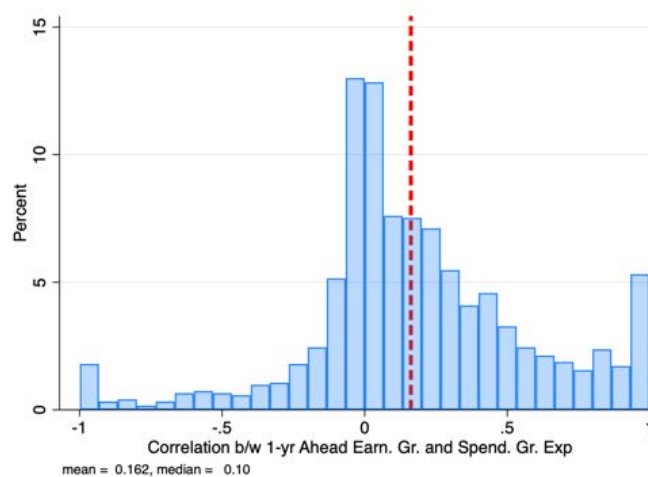
Note: The red dashed line shows the weighted mean of the individual-level correlations.

there is no systematic relationship with expected earnings growth, layoff or quit expectations, the perceived correlation between future earnings and spending growth is negatively and statistically significantly related to earnings growth uncertainty. These results are consistent with precautionary saving, where those more uncertain about their future labor market prospects anticipate smaller increases in their spending in case of a positive earnings shock.

TABLE 14: Relation of the Correlation between Year-Ahead Earnings and Spending Growth and Labor Market Risks

	(1) Corr. b/w Future Earn. and Spend. Gr.	(2) Corr. b/w Future Earn. and Spend. Gr.	(3) Corr. b/w Future Earn. and Spend. Gr.
Expected earnings growth (%)	-0.004	-0.004	-0.005
	(0.007)	(0.006)	(0.007)
Earnings growth uncertainty (pp)	-0.020***	-0.015***	-0.016***
	(0.005)	(0.005)	(0.006)
Layoff expectations (%)			0.000
			(0.001)
Quit expectations (%)			-0.000
			(0.001)
Demographics		X	X
Survey Wave FE		X	X
Dep. Var. Mean	0.160	0.161	0.168
R^2	0.036	0.071	0.067
Observations	1169	1166	1090

Note: Robust standard errors, clustered at the individual level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

10 Conclusion

In this paper we examine workers' beliefs about their earnings growth and risk of layoff and quitting. While there exists a large body of work on observed earnings and employment volatility, little is known about worker's perceptions of that variability. Knowledge of such beliefs, and how they evolve over the working life and business cycle is especially important for understanding consumer behavior. In addition to consumption and work decisions, beliefs about labor market uncertainty matter for precautionary savings and wealth accumulation, investment behavior, and demand and access to credit.

Using almost a decade worth of rich monthly panel data on probabilistic expectations from the Survey of Consumer Expectations, we find substantial heterogeneity in perceived earnings growth and employment risk across workers, underscoring the value of collecting this type of subjective expectations data. We find beliefs about future earnings growth shocks to exhibit considerable positive skewness and thickness in the right tail. Expected earnings growth is found to be negatively, and earnings growth uncertainty to be positively correlated with the perceived likelihood of both voluntary and involuntary job exits.

We find a gradual decline in average expected earnings growth and in earnings growth uncertainty over the working life, due in part to a gradual compression of individuals' density forecasts of earnings growth as well as a convergence in the dispersion (across workers) in density means. In contrast, we find average layoff risks to be remarkably stable through the working life, while average quit probabilities show a U-shape pattern in age.

During the pandemic earnings growth expectations initially fell, but then rebounded sharply, while average layoff probabilities initially jumped up and then declined rapidly to below pre-pandemic levels. In contrast, earnings growth uncertainty remained remarkably stable through

the pandemic recession.

We find workers' perceptions of labor market risks co-vary with current local labor market conditions and with their subjective expectations about the national economy, such as the unemployment rate and stock market expectations. This new evidence reveals another important channel through which local and aggregate economic conditions may affect the economic behavior of workers: through their beliefs about future economic conditions.

An important and novel contribution of this paper is its measurement of the perceived persistence of earnings growth shocks. We do so using two approaches: through a set of strategic survey questions designed to capture revisions in beliefs in case of hypothetical earnings-growth-shock scenarios, and through elicitation of the joint distributions of one-year and two-year ahead earnings growth. Both approaches yield estimates suggesting weak perceived persistence in earnings shocks, on average.

Finally, analysis of respondent's subjective joint distribution of year-ahead earnings and spending growth reveals a relatively strong association, on average, but one that is significantly weaker for respondents with higher levels of earnings uncertainty.

While illustrating the value of subjective expectations data, our study suggests several important areas for further research. There is a need for a more detailed analysis of workers' beliefs regarding the serial correlation structure in the earnings process, and the decomposition of shocks into permanent, persistent, and transitory. This likely would require collecting expectations over additional forecast horizons. In addition, it will be important to examine the role of beliefs about labor market risks on household behavior more generally, including saving, borrowing, and investment decisions.

Another interesting topic for future research would be to contrast our approach of directly eliciting expectations to the approach by Cunha et al. (2005) of inferring the predictability of future earnings as revealed by work and consumption decisions and subsequent earnings realizations. Importantly, this approach reveals the type of information individuals know *and* act upon, while elicited expectations instead reveal all beliefs, including those the individual did not act upon - either because they found no incentive to do so or because they were unable to do so. Comparing estimates from both approaches thus may shed new light on the rationality of beliefs, on the existence of constraints on individuals' choice sets, and on the insurability of predictable earnings changes.

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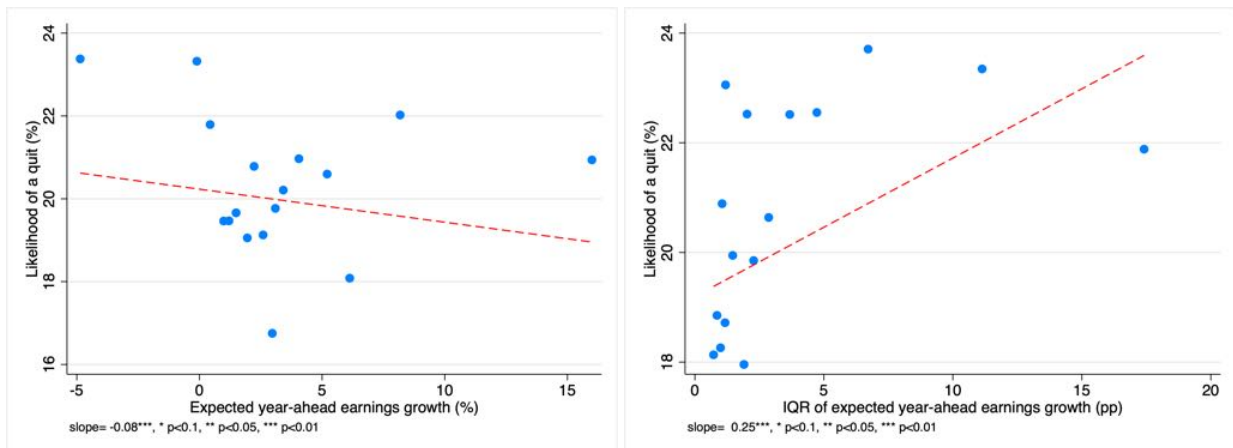
Online Appendix A   Tables and Figures

FIGURE A1: Likelihood of a Layoff and Year-Ahead Earnings Growth
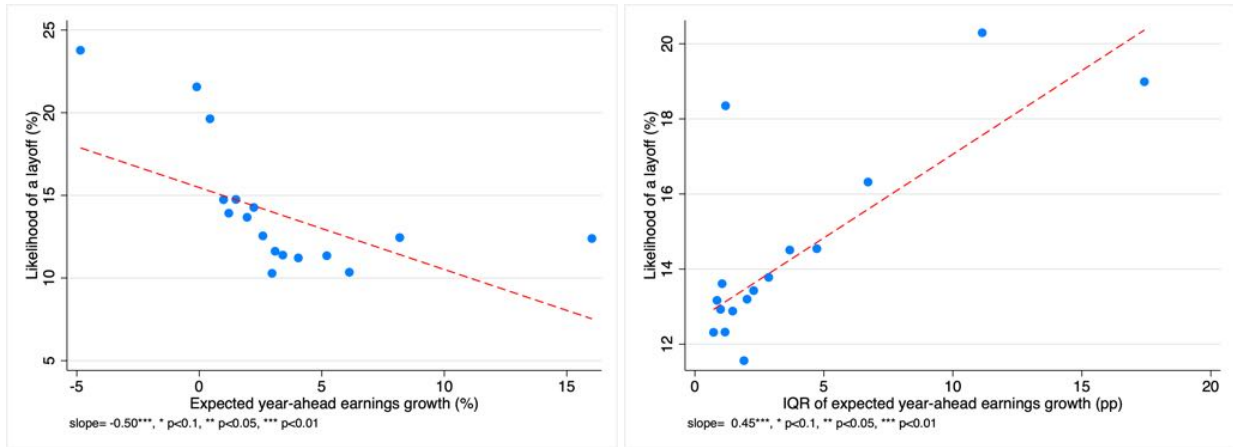
(A) Expected Earnings Growth

(B) IQR of Expected Earnings Growth

FIGURE A2: Likelihood of a Quit and Year-Ahead Earnings Growth

(A) Expected Earnings Growth

(B) IQR of Expected Earnings Growth
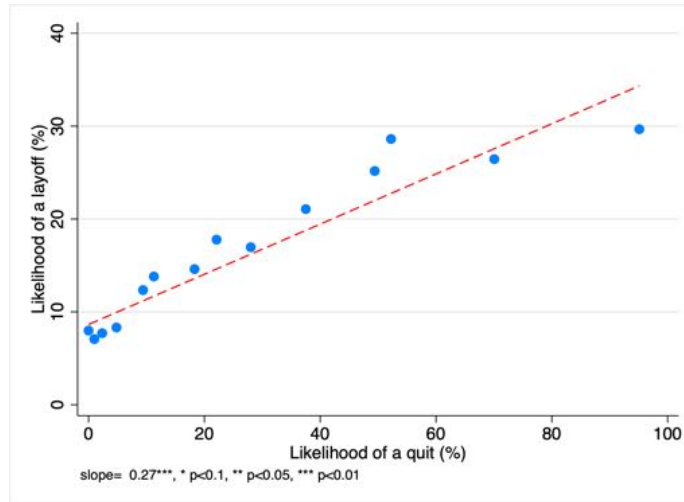
FIGURE A3: Likelihoods of Layoff and Quit

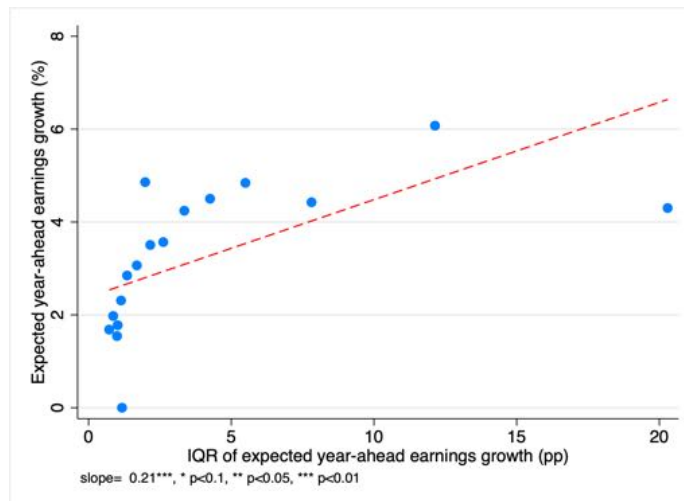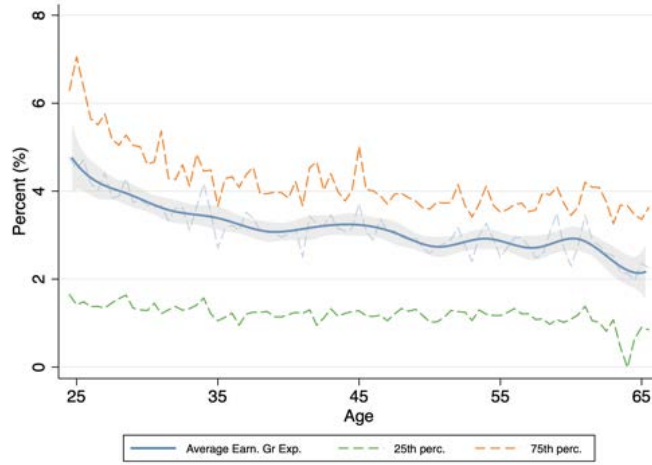**FIGURE A4:** Expected Earnings Growth and Earnings Growth Uncertainty

FIGURE A5: Residualized Earnings Growth Expectations over Working Life

Note: The earnings growth expectations series is regressed on dummies for gender, race, education, having a child under age 6, annual household income categories, Census regions, year, and self-employment. We then add the mean of original series to the residuals from the regression and plot the resulting series over the life cycle.

FIGURE A6: Residualized Earnings Growth Uncertainty over Working Life
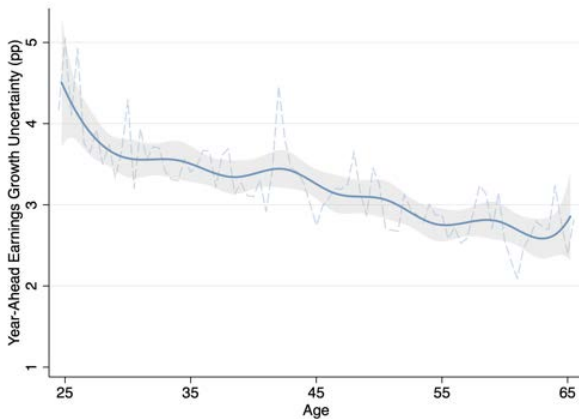
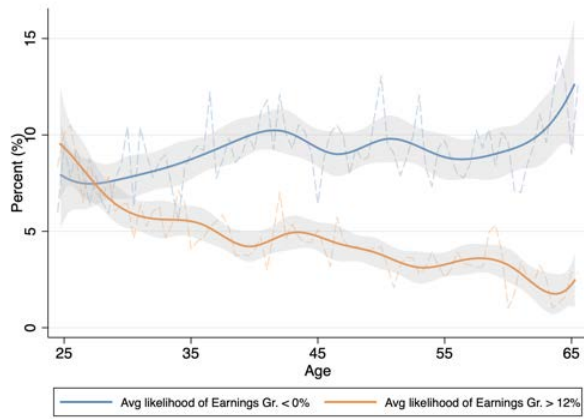**(A)** Average Uncertainty   **(B)** Tail Probabilities

Note: All the series in these two figures are regressed on a dummies for gender, race, education, having a child under age 6, annual household income categories, Census regions, year, and self-employment. We then add the mean of original series to the residuals from the regression and plot the resulting series over the life cycle.

FIGURE A7: Heterogeneity in Residualized Expected Earnings Growth over the Working Life

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Self-Employment

(F) By Job Type

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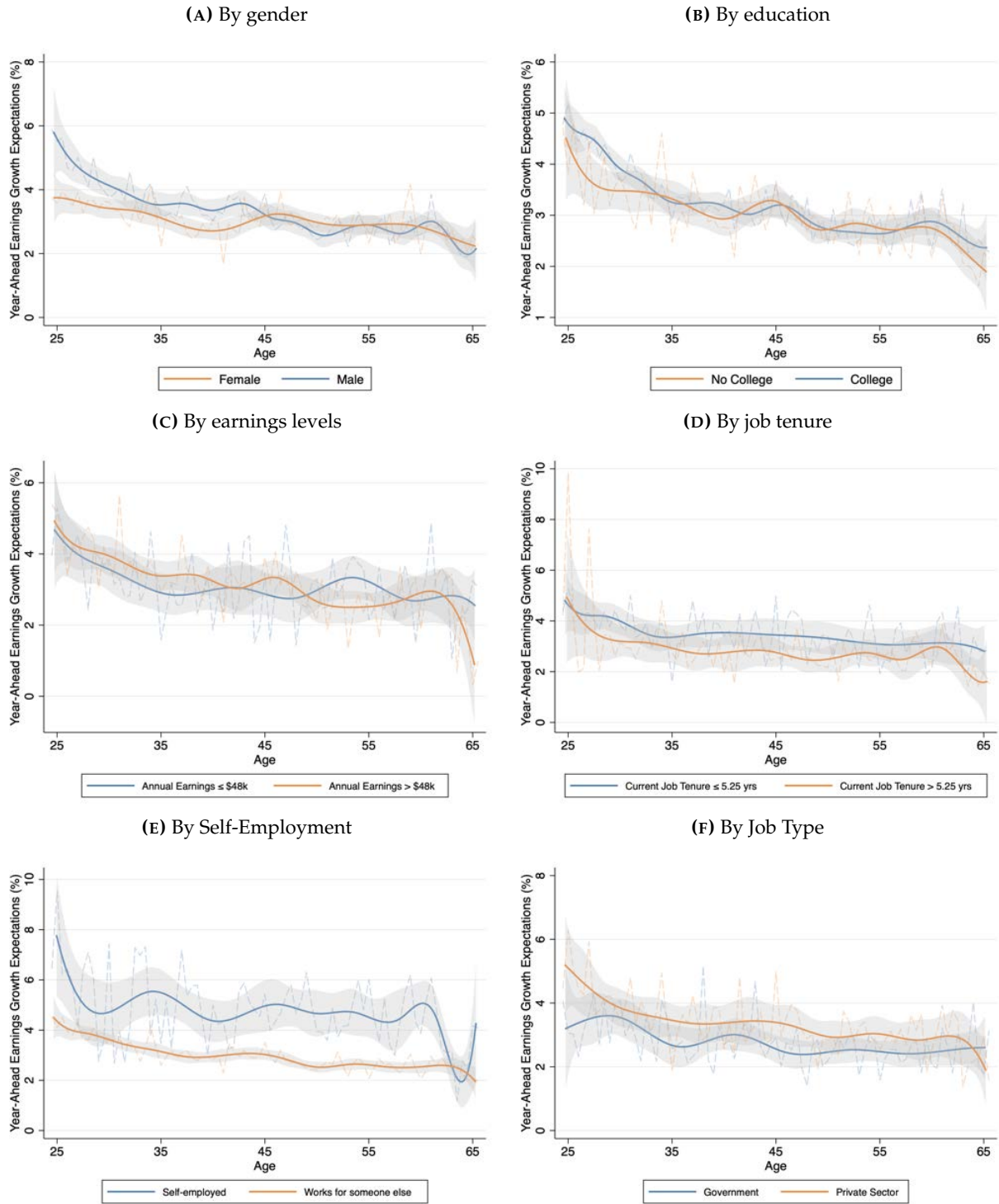
FIGURE A8: Heterogeneity in the Residualized Earnings Growth Uncertainty over the Working Life

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Self-Employment

(F) By Job Type

FIGURE A9: The Residualized Likelihood of Layoff and Quit over the Working Life
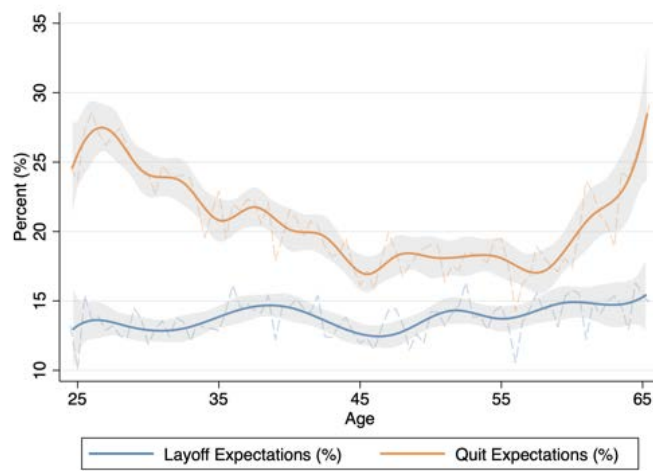
FIGURE A10: Heterogeneity in Residualized Layoff Expectations over the Working Life

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Job Type

FIGURE A11: Heterogeneity in Residualized Quit Expectations over the Working Life

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Job Type
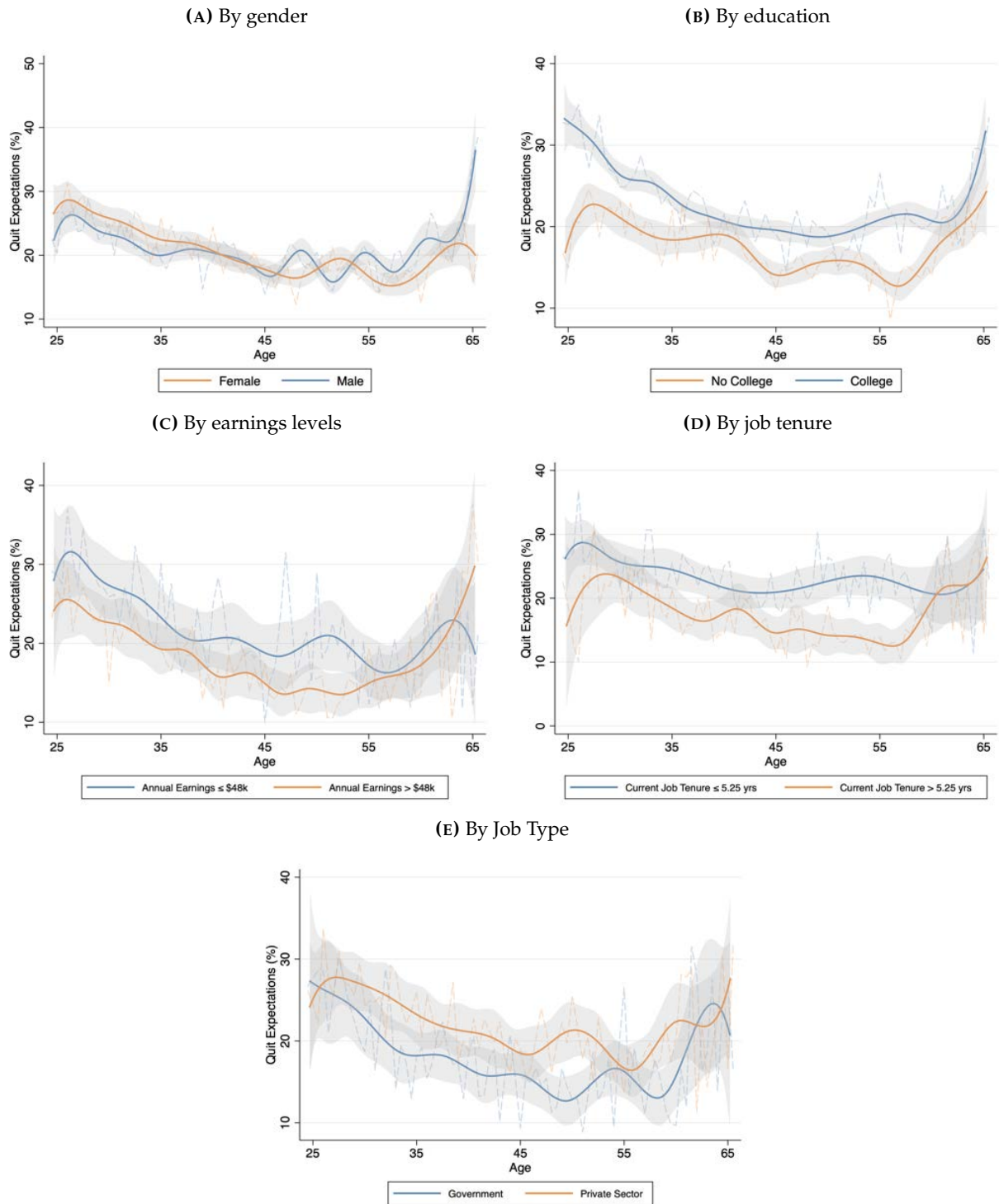
FIGURE A12: Residualized Expected Earnings Growth over the Business Cycles
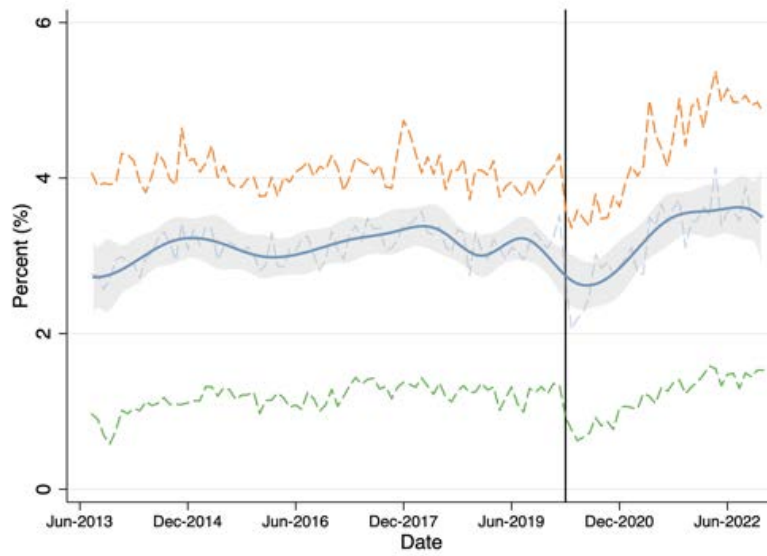
FIGURE A13: Heterogeneity in Residualized Expected Earnings Growth over the Business Cycle

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Self-Employment

(F) By Job Type
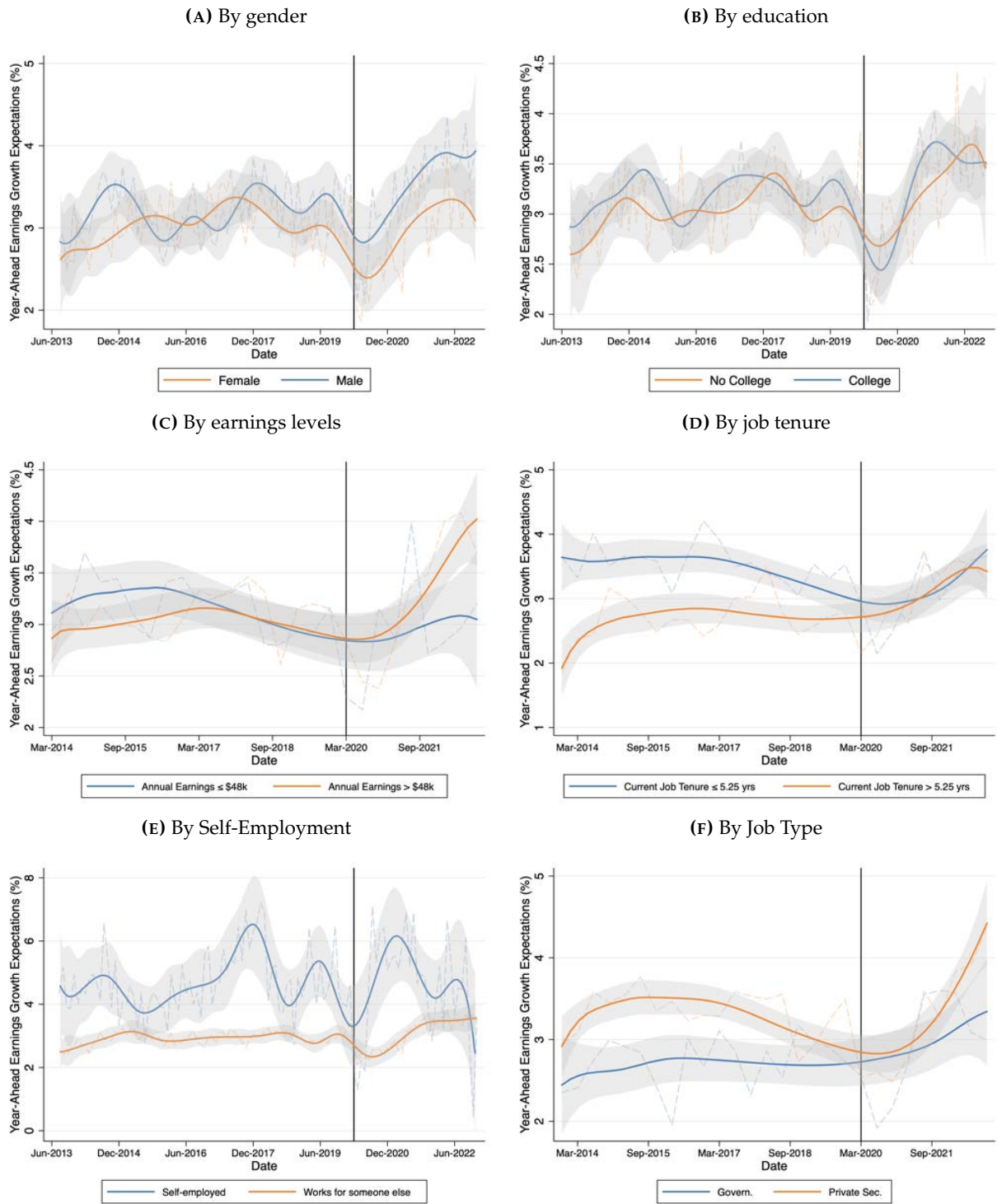
FIGURE A14: Earnings Growth Uncertainty over the Business Cycle

(A) Average Uncertainty
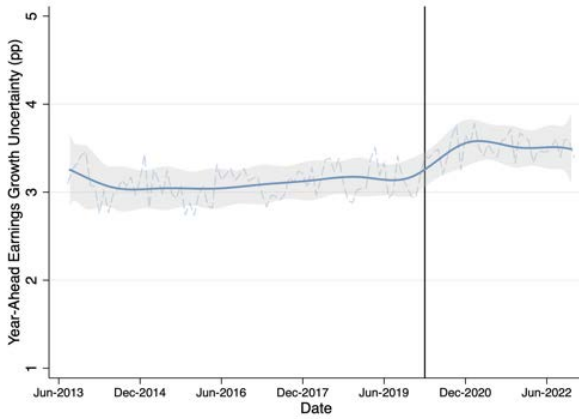
(B) Tail Probabilities
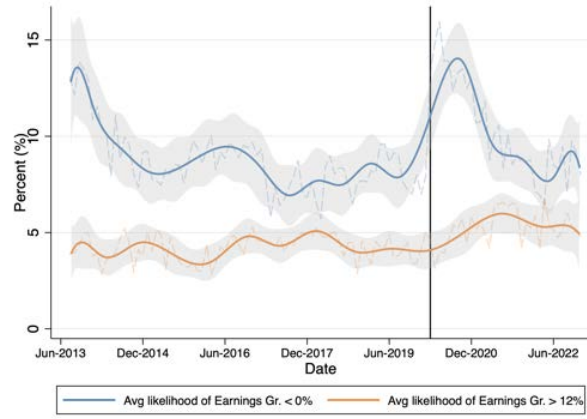
FIGURE A15: Heterogeneity in the Residualized Earnings Growth Uncertainty over the Business Cycle

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

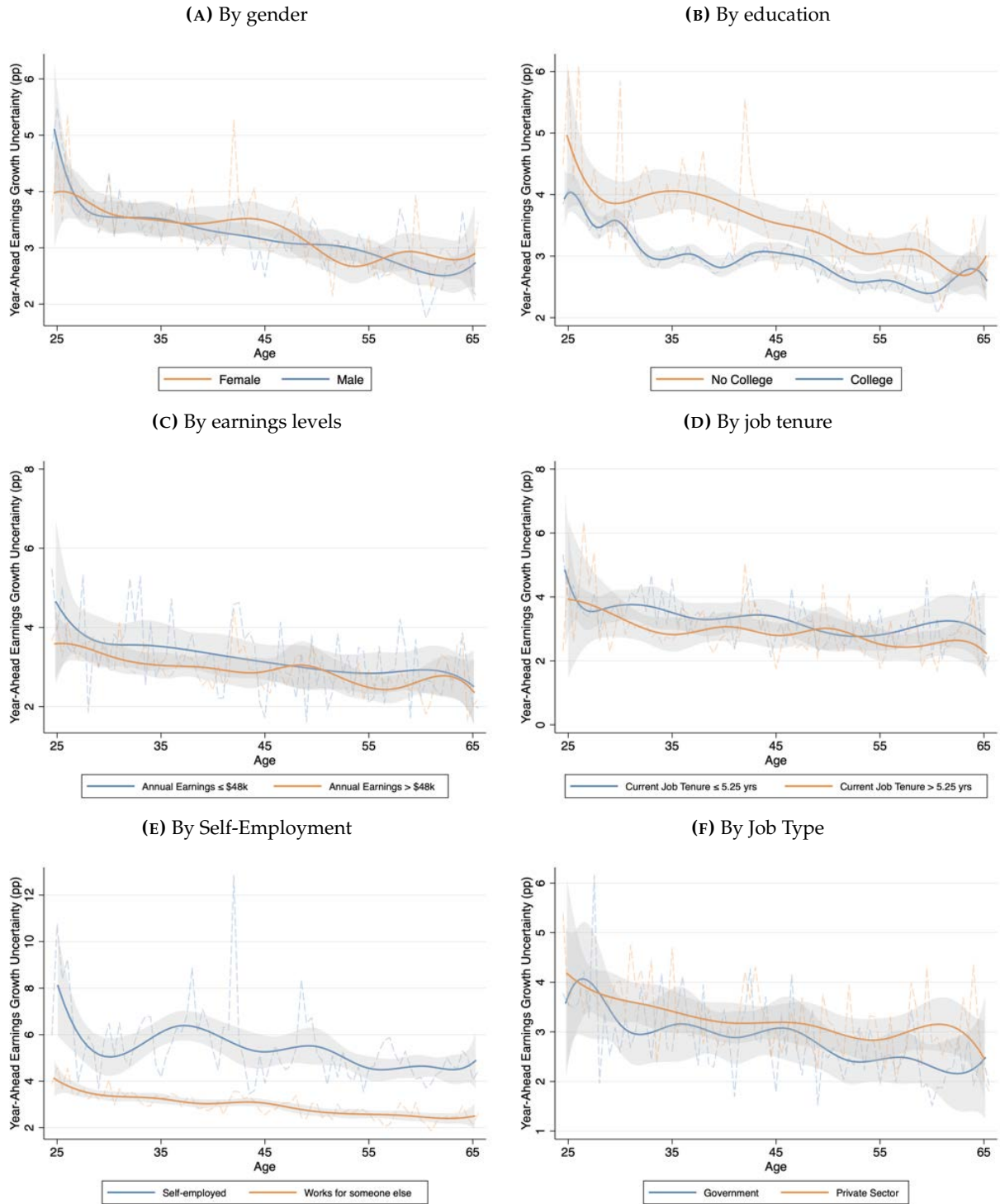**(E)** By Self-Employment

(F) By Job Type
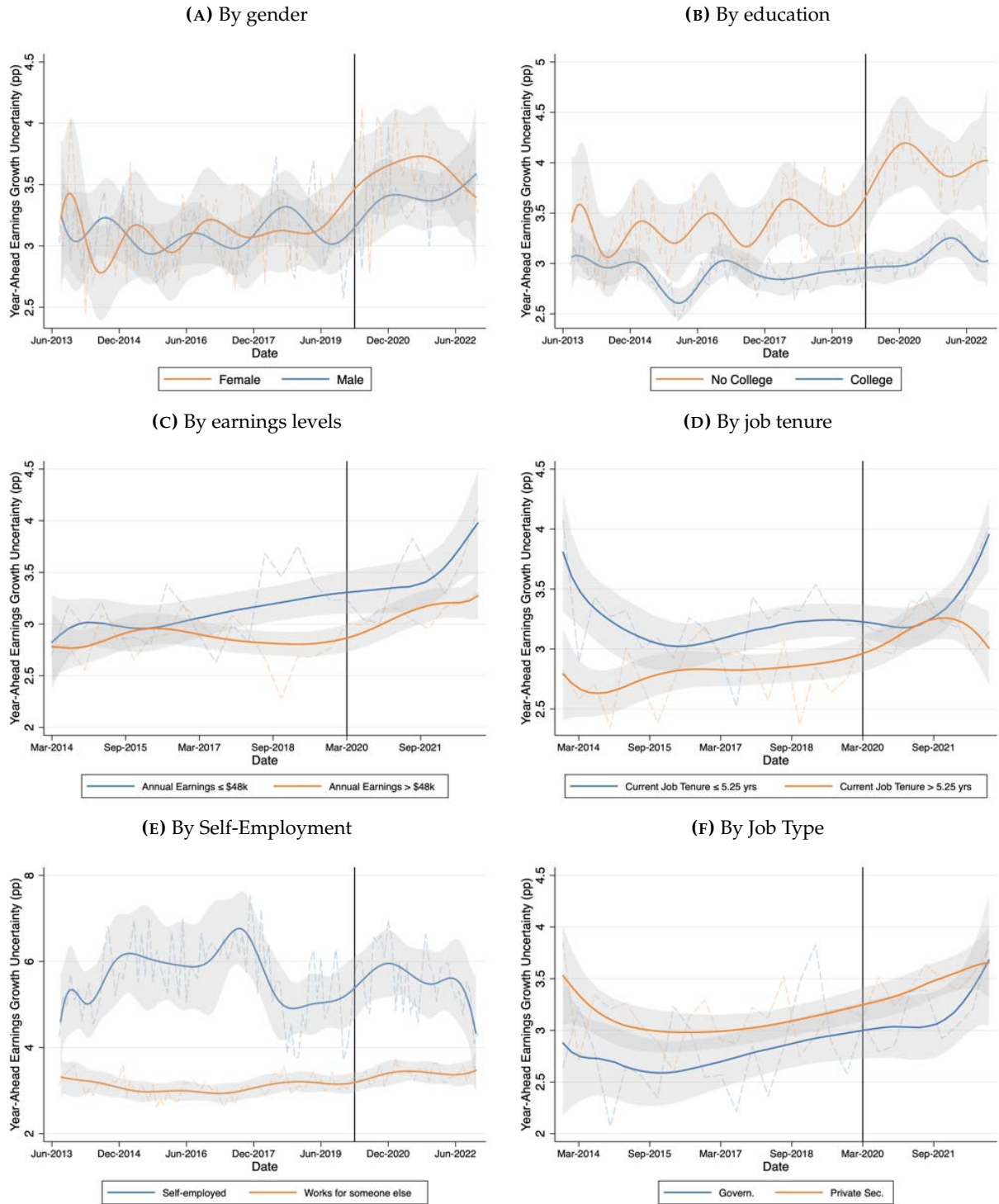
FIGURE A16: The Residualized Likelihoods of Layoff and Quit over the Business Cycle

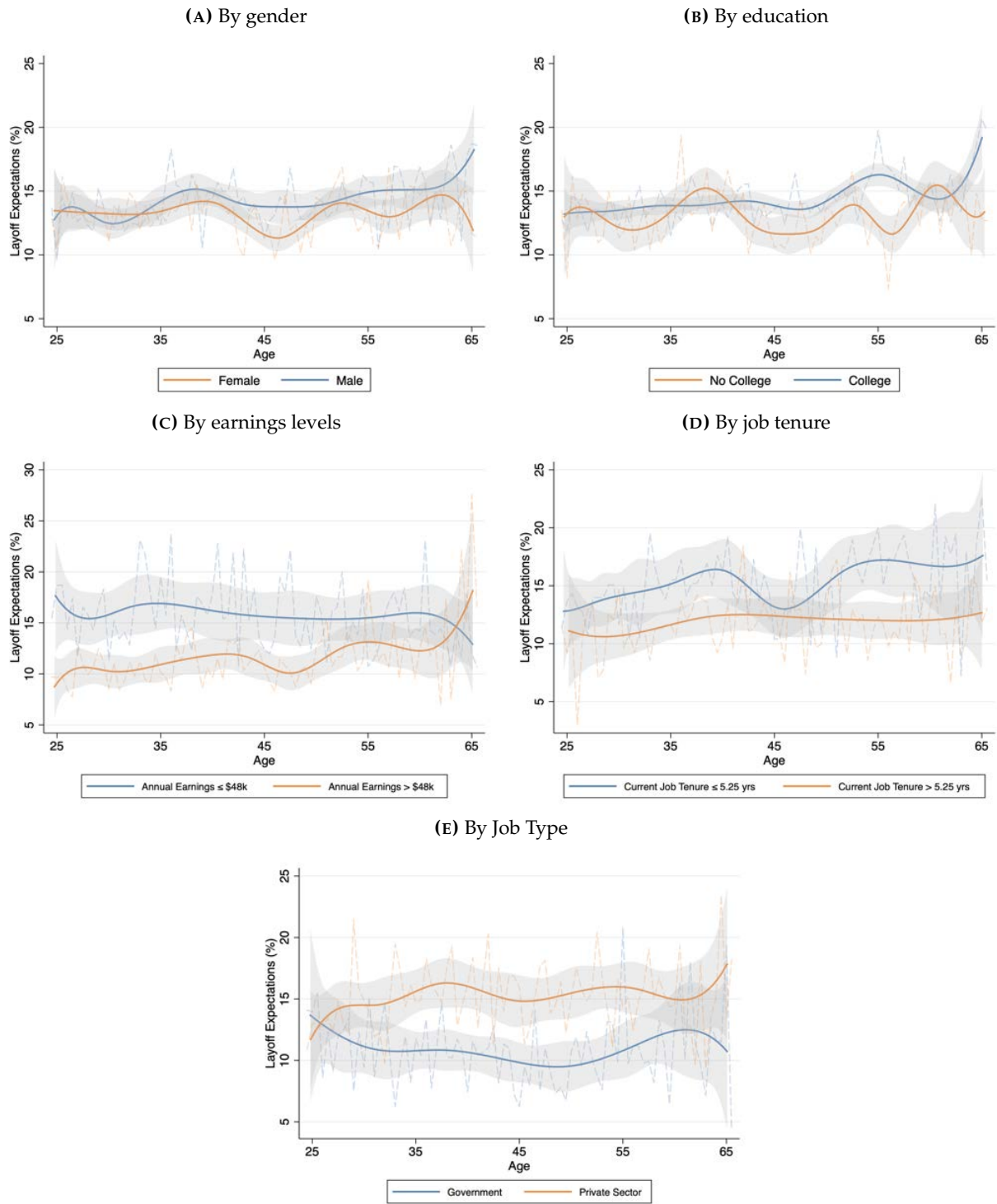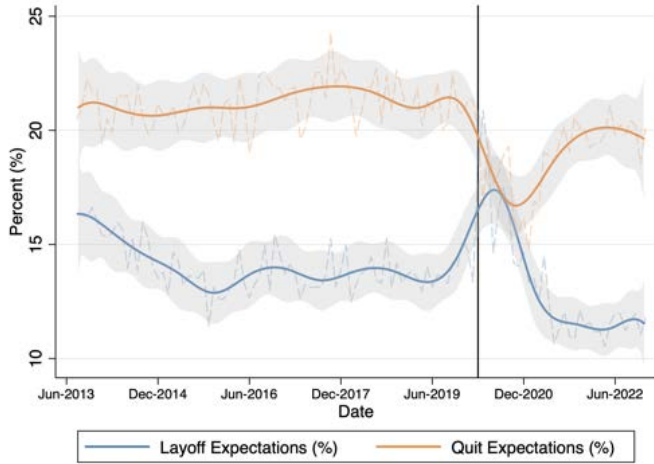**FIGURE A17:** Heterogeneity in Residualized Layoff Expectations over the Business Cycle

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Job Type
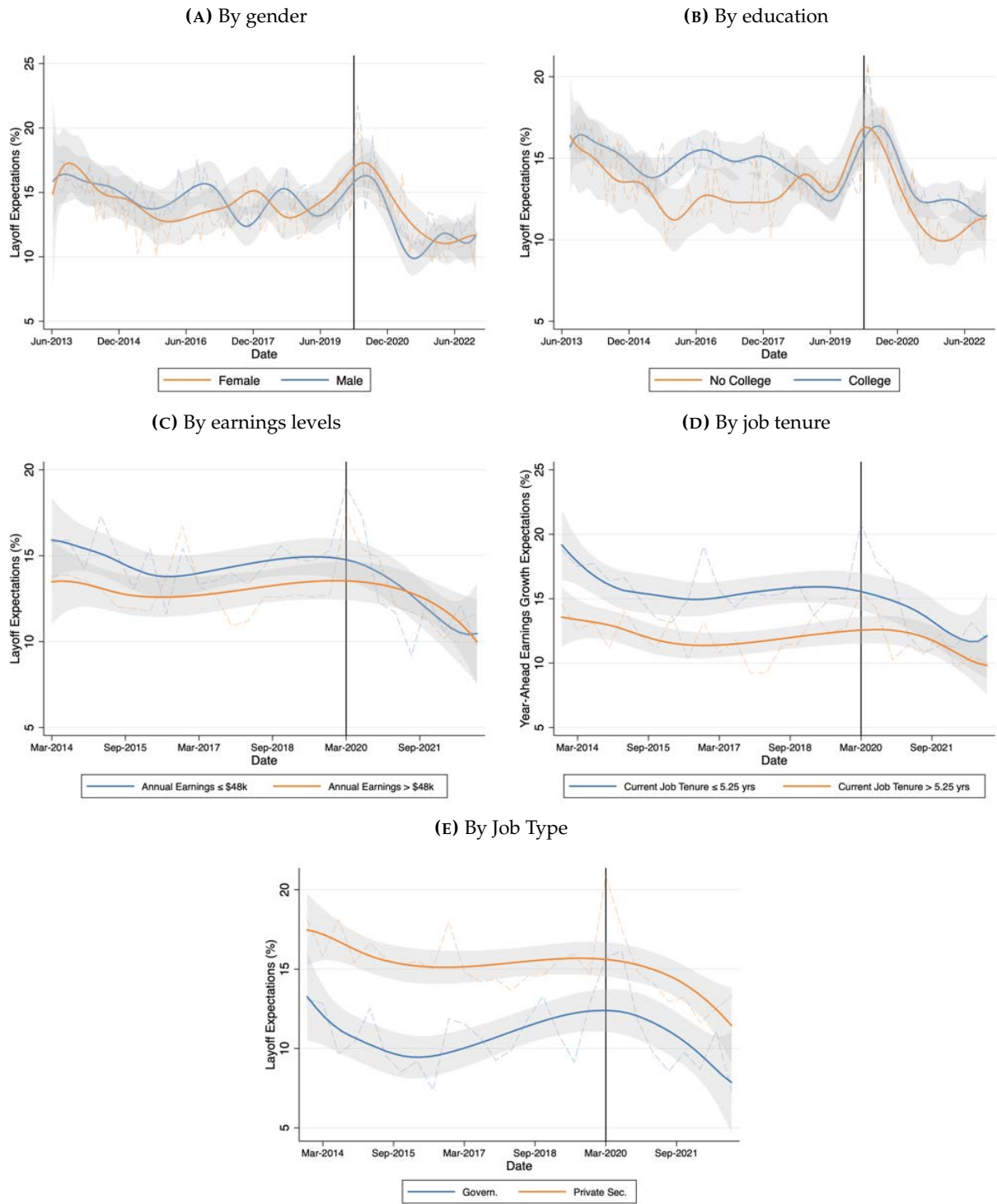
FIGURE A18: Heterogeneity in Residualized Quit Expectations over the Business Cycle

(A) By gender

(B) By education

(C) By earnings levels

(D) By job tenure

(E) By Job Type

FIGURE A19: Distribution of revisions in 2-year ahead earnings growth expectations

(A) If earnings growth in past year was 2pp lower   **(B)** If earnings growth in past year was 2pp higher

TABLE A1: Earnings Growth Expectations and Demographics

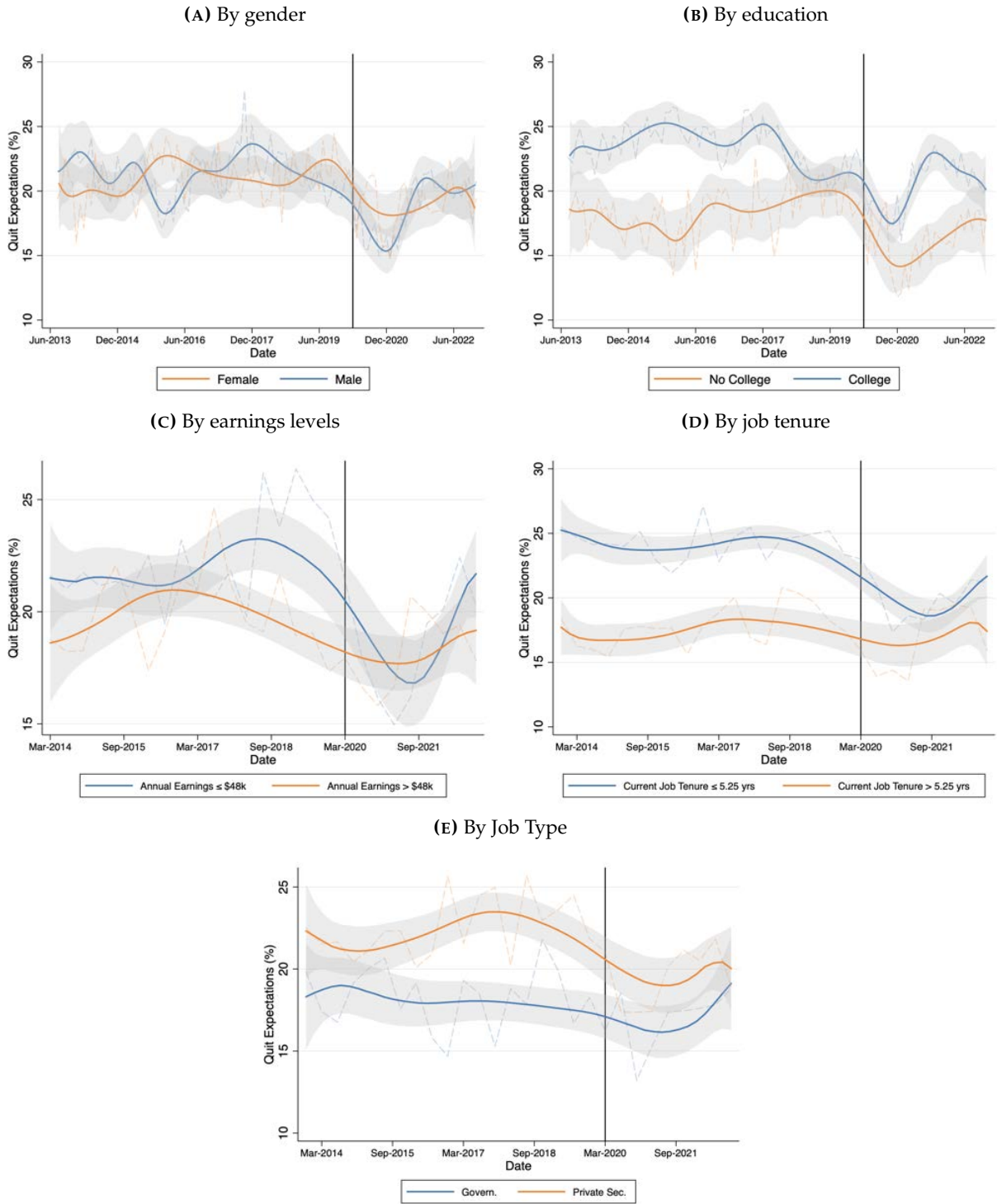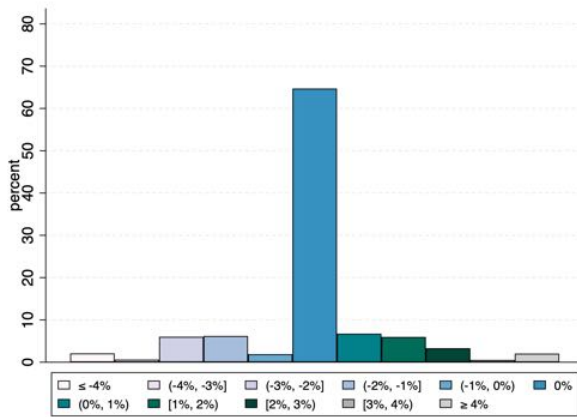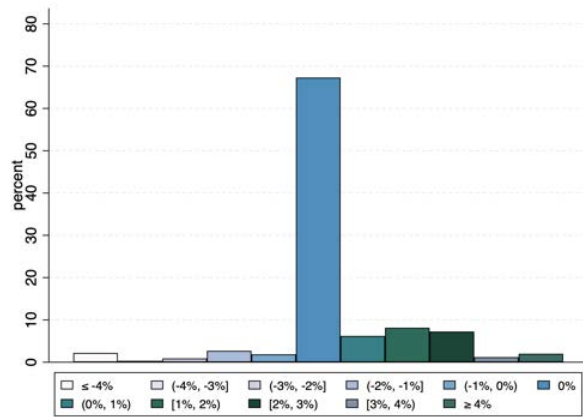|	(1) Exp. Year-Ahead Earn. Gr	(2) Exp. Year-Ahead Earn. Gr.	(3) IQR of Exp. Year-Ahead Earn. Gr	(4) IQR of Exp. Year-Ahead Earn. Gr.	(5) Density Skewn. v3	(6) Density Skewn. v3	(7) Pr(Layoff)	(8) Pr(Layoff)	(9) Pr(Quit)	(10) Pr(Quit)
White	-0.132**	-0.008	-1.891***	-1.751***	0.024***	0.036***	-1.794***	-1.875***	-2.529***	-2.828***
	(0.064)	(0.126)	(0.079)	(0.161)	(0.005)	(0.012)	(0.268)	(0.560)	(0.325)	(0.698)
Married	-0.076	-0.046	-0.446***	-0.256**	-0.004	-0.003	-1.906***	-1.301***	-2.977***	-2.800***
	(0.050)	(0.105)	(0.049)	(0.104)	(0.004)	(0.010)	(0.215)	(0.455)	(0.263)	(0.575)
Has child under age 6	0.140**	0.115	0.047	0.103	0.010*	0.018	-1.151***	-0.745	-2.704***	-2.405***
	(0.062)	(0.123)	(0.063)	(0.130)	(0.006)	(0.012)	(0.256)	(0.510)	(0.312)	(0.639)
Female	-0.285***	-0.155*	0.046	-0.087	-0.028***	-0.025***	-0.941***	-1.078***	-0.279	-0.307
	(0.045)	(0.090)	(0.043)	(0.090)	(0.004)	(0.009)	(0.188)	(0.412)	(0.231)	(0.514)
College graduate	0.236***	-0.073	-0.955***	-0.629***	0.028***	0.032***	-0.178	1.548***	4.369***	5.767***
	(0.041)	(0.090)	(0.037)	(0.083)	(0.004)	(0.009)	(0.169)	(0.372)	(0.213)	(0.497)
35 < Age ≤ 45	-0.624***	-0.499***	-0.449***	-0.439***	-0.032***	-0.009	0.254	0.957*	-5.406***	-5.304***
	(0.061)	(0.127)	(0.059)	(0.117)	(0.006)	(0.012)	(0.241)	(0.509)	(0.306)	(0.662)
45 < Age ≤ 55	-0.999***	-0.796***	-0.933***	-0.667***	-0.061***	-0.025*	-0.284	1.100**	-7.780***	-6.493***
	(0.062)	(0.131)	(0.063)	(0.128)	(0.006)	(0.013)	(0.256)	(0.555)	(0.319)	(0.731)
55 < Age ≤ 65	-1.189***	-0.871***	-1.257***	-0.881***	-0.066***	-0.029*	0.406	1.669***	-6.514***	-4.720***
	(0.070)	(0.144)	(0.065)	(0.150)	(0.006)	(0.015)	(0.307)	(0.632)	(0.381)	(0.846)
Working FT	0.496***	0.331*	-0.917***	-0.642***	-0.016**	-0.011	-6.216***	-2.265***	-6.931***	-3.826***
	(0.072)	(0.179)	(0.074)	(0.220)	(0.006)	(0.019)	(0.343)	(0.818)	(0.394)	(1.014)
Self-employed	1.863***		2.518***		-0.034***					
	(0.103)		(0.083)		(0.007)					
Log annual earnings		0.294***		-0.409***		0.006		-2.677***		-2.394***
		(0.082)		(0.090)		(0.009)		(0.390)		(0.443)
Working for government		-0.476***		-0.354***		-0.012		-4.431***		-3.974***
		(0.082)		(0.092)		(0.009)		(0.370)		(0.489)
Tenure at current job		-0.044***		-0.022***		-0.002***		-0.161***		-0.250***
		(0.005)		(0.005)		(0.001)		(0.025)		(0.034)
Region Dummies	X	X	X	X	X	X	X	X	X	X
Year Dummies	X	X	X	X	X	X	X	X	X	X
Dep. Var. Mean	3.120	2.970	3.446	3.000	1.119	1.123	14.019	13.617	20.013	19.821
R^2	0.026	0.031	0.093	0.079	0.008	0.009	0.023	0.046	0.036	0.058
Observations	88813	16245	88813	16245	88813	16245	80004	16381	79329	16384

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Density skewness v3 refers to $\frac{(p95-p50)}{p50-p5}$ of the earnings growth expectations (density means) in the sample. Tenure at current job and whether the respondent works at a government job or a private sector are asked to those who are not self-employed. These questions along with the question on earnings are only included in the Labor Market module of the SCE, which is fielded every 4 months. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE A2: Individual-level Correlations between 1-year and 2-year ahead Earnings Growth and Expectations Measures

	(1) Corr. b/w 1-yr and 2-yr Exp. Earn. Gr.	(2) Corr. b/w 1-yr and 2-yr Exp. Earn. Gr.	(3) Corr. b/w 1-yr and 2-yr Exp. Earn. Gr.	(4) Corr. b/w 1-yr and 2-yr Exp. Earn. Gr.	(5) Corr. b/w 1-yr and 2-yr Exp. Earn. Gr.
White	0.04	0.03	0.01	0.02	0.03
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Married	0.01	0.01	-0.00	0.00	0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Has child under age 6	0.03	0.04	0.03	0.03	0.04
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Female	-0.04	-0.05	-0.05*	-0.05*	-0.05*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
College graduate	0.04	0.04	0.02	0.04	0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
$35 < \text{Age} \leq 45$	-0.05	-0.05	-0.06*	-0.05	-0.05
	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)
$45 < \text{Age} \leq 55$	-0.05	-0.05	-0.08*	-0.05	-0.05
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
$55 < \text{Age} \leq 65$	-0.06	-0.07	-0.09*	-0.06	-0.06
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Working FT	-0.00	0.00	-0.02	-0.04	-0.04
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Self-employed	-0.01	-0.00	0.03		
	(0.06)	(0.06)	(0.06)		
Expected earnings growth (%)		-0.01**	-0.01**		
		(0.00)	(0.00)		
Earnings growth uncertainty (pp)			-0.02***		
			(0.00)		
Layoff expectations (%)				-0.00	
				(0.00)	
Quit expectations (%)					-0.00
					(0.00)
Survey Wave FE	X	X	X	X	X
Dep. Var. Mean	0.09	0.09	0.09	0.09	0.09
R^2	0.02	0.03	0.05	0.02	0.02
Observations	1267	1261	1261	1185	1185

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE A3: Relation of the Correlation between 1-year ahead Earnings and Spending Growth and Labor Market Risks

	(1) Corr. b/w 1-yr Exp. Earn. and Spend. Gr.	(2) Corr. b/w 1-yr Exp. Earn. and Spend. Gr.	(3) Corr. b/w 1-yr Exp. Earn. and Spend. Gr.	(4) Corr. b/w 1-yr Exp. Earn. and Spend. Gr.	(5) Corr. b/w 1-yr Exp. Earn. and Spend. Gr.
White	0.08**	0.07**	0.05	0.07*	0.07*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Married	0.02	0.03	0.02	0.04	0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Has child under age 6	0.06	0.05	0.05	0.06	0.06
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Female	0.01	0.00	0.00	0.01	0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
College graduate	0.08***	0.08***	0.06**	0.07**	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
$35 < $ Age ≤ 45	0.05	0.05	0.04	0.04	0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
$45 < $ Age ≤ 55	0.07*	0.07*	0.05	0.07*	0.06*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
$55 < $ Age ≤ 65	0.14***	0.12***	0.11**	0.12***	0.12**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Working FT	0.10**	0.10**	0.09**	0.07*	0.07*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Self-employed	-0.09	-0.11*	-0.08		
	(0.06)	(0.06)	(0.06)		
Expected earnings growth (%)		-0.00	-0.00		
		(0.01)	(0.01)		
Earnings growth uncertainty (pp)			-0.02***		
			(0.01)		
Layoff expectations (%)				-0.00	
				(0.00)	
Quit expectations (%)					-0.00
					(0.00)
Survey Wave FE	X	X	X	X	X
Dep. Var. Mean	0.16	0.16	0.16	0.17	0.17
R^2	0.05	0.05	0.07	0.05	0.05
Observations	1168	1166	1166	1091	1091

Note: Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Online Appendix B   Details on the Survey Instrument

Online Appendix B.1   Strategic Survey Questions

As explained in the text, in the July 2022 survey module in case of the first scenario the respondent is asked: *"What if in the past year your annual earnings had increased by x+2% instead of x%"*, where *x* was their reported past-year increase in earnings.[39] The respondent was then asked *"Under this scenario, would the increase you expect in your earnings for the next 12 months be different from the [X] percent you reported earlier?"*, where *[X]* represents the previously reported expectation of year-ahead earnings growth. A qualitative follow-up question, using a 5-point Likert scale, then asked whether in that scenario the respondent expected earnings growth for the year-ahead to be much lower, slightly lower, unchanged, slightly higher or much higher. Based on the response, the respondents were then shown quantitative options that ranged from a revision of -4.0% to +4.0%, with an option to provide a response outside that range.

In September 2022, we randomly assigned respondents two different formats for answering the follow-up questions. The first block followed the survey module from July 2022. The second block instead showed a follow-up sequence that started with asking whether respondents' expectations under the scenario would be the same as what they reported initially or different. If the respondent indicated that they would expect a different change in their earnings over the next 12 months, the follow-up sequence continued with asking for the amount of the revision, rather than showing them different bins. Results show the average revisions in these different blocks to be largely similar across the different versions and they are available upon request.

Online Appendix B.2   Elicitation of Conditional Densities

As explained in the text, we elicited the marginal density for one-year ahead earnings growth (conditional on continuing to work, not necessarily at the same job), using 4 bins. In September, we randomly assigned respondents two different formats. In the first block, we followed the same approach from May 2022 to elicit the marginal density for the year-ahead earnings growth and the conditional densities for the two-year ahead earnings growth and year-ahead spending growth. In the second block, we increased the number of bins to elicit the marginal density and adjusted the width of the bins in the following manner:

Please think again about the year ahead, and assume that you will continue to work over the next year. In your view, what would you say is the percent chance that 12 months from now ...
Your earnings, before taxes and deductions will have ...

increased by 8% or more	_____	*percent chance*
increased by 4% to 7.99%	_____	*percent chance*
increased by 2% to 3.99%	_____	*percent chance*
increased by 0% to 1.99%	_____	*percent chance*
decreased by 0% or more	_____	*percent chance*
Total	100	

To elicit the conditional density of two-year ahead earnings growth in this block of the September survey, respondents were then told *"In the next few questions we are interested in what you expect to happen to your annual earnings two years from now, that is between September 2023 and September 2024, under five different scenarios."* They are then sequentially asked to imagine these different scenarios, starting with *"imagine that your annual earnings decrease by 0% or more over the next 12 months"*, followed by *"Next, imagine that your annual earnings increase by between 0% and 1.99% over the next 12 months"*, and similarly for year-ahead earnings growth of between 2.0% and 3.99%, between 4% and 7.99%, and growth by 5% or more. For each scenario, the respondents were asked to report the percent chance that their earnings growth between

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[39]We used appropriately adjusted language for those who reported a decrease or no change in their earnings over the past year.

September 2023 and September 2024 will fall into each of the same five intervals. In the case of eliciting the conditional density of year-ahead spending growth in this block of the September survey, scenarios were exactly the same as in the case of eliciting the conditional density for the two-year ahead earnings growth, but the respondents were asked to report the percent chance that their household spending growth between September 2022 and September 2023 will be *"less than 0%, "between 0 and 2.99%", "between 3% and 5.99"*, and *"6% or more."*

We followed a similar approach to elicit the marginal and conditional densities in the December 2022 survey. To elicit the marginal density of year-ahead unconditional earnings growth, we started with the 5-bin question as in the second block in the September survey, with the same bin widths. Once respondents report their expectation, we presented them the same question again, this time with different bins. Specifically, if they put a larger than 50% mass in one bin, we broke that bin into finer bins, while keeping the total number of bins at five. To elicit the conditional densities of two-year ahead earnings growth and the year-ahead spending growth, we used the bins from this second marginal density question. This approach was designed to limit the number of respondents putting all the mass in one bin, which prevents us from estimating a correlation for them. Results show that the three approaches produce similar means and distributions for the individual-level correlations.

The individual-level correlations reported in the text are calculated by fitting a bivariate normal distribution to each individual's implied joint density based on what they reported for the marginal and the conditional densities. Another way of calculating these correlations is through a discrete approximation where the mass within any bin is assumed to be on the mid-point of that bin. The individual-level correlations calculated with discrete approximation have similar distributions to those estimated assuming a bivariate normal distribution (see Figure B1 below) and largely follow the same heterogeneity patterns as in the case of bivariate normal distribution (see Tables B1 and B2 below).

FIGURE B1: Histograms of Individual Level Correlations using Discrete Approximation
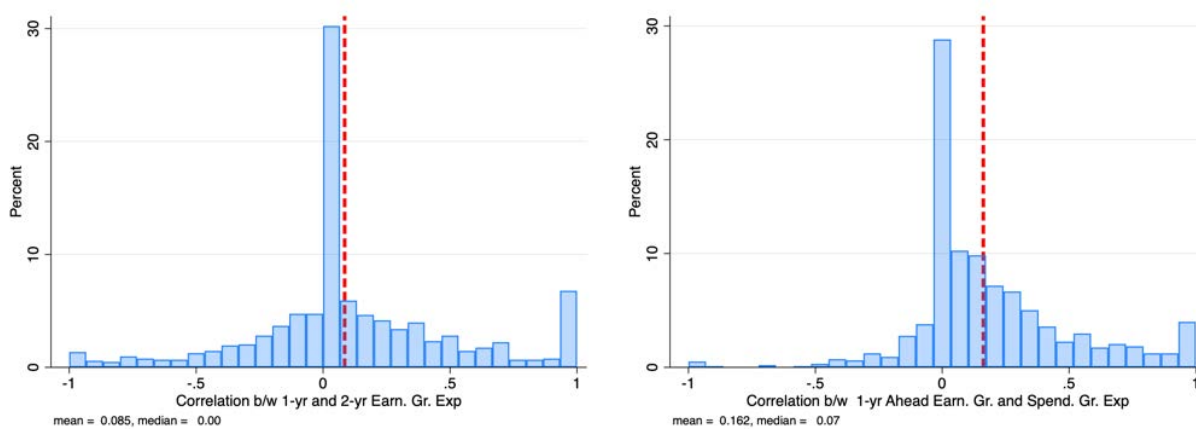
(A) Between 1-year and 2-year Ahead Earnings Growth   **(B)** Between 1-year Ahead Earnings and Spending Growth

Note: The red dashed line shows the weighted mean of the individual-level correlations.

Regardless of whether we assume the discrete or bivariate joint normal distribution, we cannot estimate the individual-level correlations for some respondents. This happens if individuals put all the mass in only one bin for one or both of the two variables. In such cases where a marginal distribution has 100% probability assigned to one bin, the correlation between the two variables is not identified. For the joint density between one-year and two-year ahead earnings growth, out of 1936 respondents, we cannot estimate the individual-level correlations of 949 and 851 respondents with discrete and bivariate normal specifications, respectively. For the joint density between one-year ahead earnings and spending growth expectations, out of 1812 respondents, we can't estimate the individual-level correlations of 853 and 639 respondents with discrete and bivariate normal specifications, respectively. While this is no a priori reason to expect the distribution of correlations for these individuals to differ from those whose responses permitted identification,

TABLE B1: Individual-level Correlations between 1-year and 2-year Ahead Expected Earnings Growth

	Mean	Std. Dev.	p10	Median	p90
Overall	0.085	0.42	-0.39	0.00	0.69
Female	0.099	0.44	-0.38	0.00	0.88
White	0.087	0.42	-0.39	0.00	0.70
Married	0.091	0.43	-0.40	0.00	0.70
College graduate	0.115**	0.40	-0.31	0.00	0.70
35< Age ≤45	0.110	0.41	-0.37	0.00	0.70
45< Age ≤55	0.041*	0.47	-0.61	0.00	0.70
55< Age ≤65	0.084	0.39	-0.31	0.00	0.64
Has child under age 6	0.115	0.44	-0.33	0.00	0.90
Working FT	0.082	0.43	-0.42	0.00	0.70
Self-employed	0.031	0.45	-0.73	0.00	0.51

Note: The stars shows the significance of pairwise tests for equality of means between the group that is shown and the opposite group. For age groups, the tests are against the group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE B2: Individual-level Correlations between 1-year Ahead Expected Earnings and Spending Growth

	Mean	Std. Dev.	p10	Median	p90
Overall	0.162	0.31	-0.09	0.07	0.61
Female	0.163	0.35	-0.14	0.07	0.71
White	0.171**	0.32	-0.09	0.08	0.66
Married	0.169	0.31	-0.06	0.09	0.61
College graduate	0.197***	0.30	-0.00	0.11	0.64
35< Age ≤45	0.159	0.30	-0.04	0.07	0.58
45< Age ≤55	0.159	0.31	-0.09	0.09	0.63
55< Age ≤65	0.206*	0.34	-0.05	0.06	0.74
Has child under age 6	0.195	0.33	-0.05	0.13	0.69
Working FT	0.177***	0.31	-0.06	0.08	0.66
Self-employed	0.055***	0.33	-0.26	0.00	0.43

Note: The stars shows the significance of pairwise tests for equality of means between the group that is shown and the opposite group. For age groups, the tests are against the group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

in both cases, we found these respondents to be less likely to be college graduates, more likely to be over age 45 and self-employed.